ON05723

Testing Children for Grapheme Recognition Problems and Reversal Tendencies for Syllabic Orthographies using a Computer Programmed Test

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SEP 19 1990
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(Submitted in partial fulfillment of the requirements
for the degree of Master of Education)

College of Education
BROCK UNIVERSITY
St. Catharines, Ontario
July 31, 1990

92-06381/

Acknowledgements

I would like to acknowledge the help that has been afforded to me by the staff of the Brock College of Education. Special thanks must go to Dr. M. Richards for her inspiring psycholinguistics classes and the help and encouragement given me as my project adviser.

I would like to also thank the many people at Kativik School Board who gave a great deal of their time and expertise to me throughout this project. A special thanks must go to Luke Palliser for his diligent work at writing the testing software.

I would like also to thank those teachers who, all of their own volition and all on their own, spent much time and effort testing their students. Their help is greatly appreciated.

Finally, I would like to thank my family, my wife especially, for their support and encouragement. All of the aforementioned can rightfully claim a share in any useful testing tools that may come out of this project. Any and all defects I will willingly admit to being mine.

Abstract

A computerized test to identify syllabic recognition and reversal problems was written and field tested in six Kativik School Board Schools. The test allowed students to respond to forty sets of matching and non-matching syllabics presented for a fixed duration on the computer screen. This test was similar to, but an extension of one of the initial visual discrimination tests given to young students as part of the child's prereading readiness testing. However because of the difficulties in meeting with interested teachers before mid-October, the students were not tested until November limiting the value of the test. The results were recorded automatically for future analysis. Due to a programming/hardware incompatibilty no usable results were actually recorded. Some anecdotal comments did however provide some encouragement to continue the development of the tests. Students were able to process the test with minimal help from the teacher. The students enjoyed doing this type of test.

By November the students with no learning deficits were able to complete the test with no apparent problems.

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CHAPTER ONE:

Introduction to the Study.

Historic Review

A quick review of the development of the Inuktitut syllabary may give some perspective to the discussion to follow. The work of the Reverend James Evans is the real beginning point of the syllabic writing system. Prior to 1840, while living in southern Ontario, he had tried to record the Ojibway speech using the Roman alphabet. Unhappy with it, he created his own. He used Pitman shorthand as a basis for the first syllabic system, one that was, however, never introduced to the Ojibway. Not until he moved to Norway House in 1840 did the Cree language cause him to revive his original system with modifications. By 1861 the British and Foreign Bible Society had a complete Bible in Cree Syllabic script.

The initial introduction of this system to the Inuit occurred in 1856 and by 1865 revisions were being made to accommodate the Inuktitut language. The two missionaries, Horden and Watkins, introduced into the system the use of syllable-final consonants as well as the vowel-lengthening dot which they had copied from the missionary Robert Hunt. These refinements lingered in relative obscurity for almost 110 years, coming into their own, and not without some resistance, finally in the 1970's.

For almost one hundred years the only written materials available to the Inuit were Bibles, tracts, hymnals, and the like. But, in the 1960's the need for written material multiplied rapidly, especially in the somewhat more isolated areas such as Arctic Quebec. School programs,

inter-settlement communications, and Inuit-Government negotiations all demanded to be in written form. Technology and industry have rapidly broadened the syllabic base, one of the healthiest signs for the survival of this writing system.

Statement of the Problem

Scanning Difficulties

Due to the difficulty in generating fluency amongst the Inuit students in reading Inuktitut in the syllabic orthography, we need to continuously assess our teaching methods. In discussions with Mary Elijasiapik and Judy Macarthur, the special education counselors for Kativik School Board, I was alerted to a number of difficulties for reading in syllabic Inuktitut. Mary demonstrated how scanning syllabic text is almost impossible. Mary identified the shapes of the syllabics as well as the varied size of the symbols as part of the difficulty. For instance, the final and diacritic characters found within the orthography are not only of different size but, also, are very important in clarifying meaning. Thus, there is a size change and also a content density change attached to these special characters. Mary showed how she tries to scan syllabics chunk by chunk but is slowed by the medial diacritics and, as well, although to a lesser extent, also the finals. Since such diacritics are so important, Mary wants to make sure she has read them correctly before reading further (M. Elijasiapik & J. Macarthur, personal communication, February 15, 1990). While content density is not addressed by this test, more efficient shape identification should help speed the process.

Another difficulty discussed was that of predictability or anticipation. Mary believes that, due to the structure of the language, it is very difficult to anticipate what the next language chunk will contain. In a test with unfamiliar text, Mary, who is a fairly good reader herself, was unable to predict what the next chunk would be.

The Need to Subvocalize

Mary's definition of a GOOD READER is telling. Her definition of a good reader is a person who can take phrases not seen before and vocalize them without hesitations, even if it is old language. According to Judy Macarthur, mature Inuit who are poor readers, even when reading for themselves, tend to subvocalize a difficult phrase more than once before completing it (J. Macarthur, personal communication, February 15, 1990). Mary stated that most persons subvocalize. Thus vocalization is important in the reading process.

The phonetic nature of the writing system may be responsible for this ready vocalization or subvocalization. An attempt to restrain Mary from subvocalizing proved to be frustrating for her. For Mary, the symbol stood for a sound which was then translated into meaning, not a direct jump from symbol to meaning.

The need to vocalize may have other consequences. From experience, we know that lengthy texts (i.e., instructions, etc.) are very difficult for people to comprehend. Their continuous need for this symbol/sound/meaning decoding process is so demanding that, by the time the reader has reached the end of a paragraph, the beginning content has often been forgotten.

Summary Statement

The problem is the apparent difficulty in achieving fluency for the reader of syllabic Inuktitut because of a variety of known and unknown factors such as scanning obstacles, vocalization needs, etc. Since minimal research has been done on the visual attributes of the syllabic characters and the consequences for fluency, it is important to start to address these.

The test is meant to create a set of reading readiness tests which is less teacher-dependent, because Inuit teachers often use tests as teaching tools rather than as a diagnostic tools. As well, however, the test results are to provide additional information for the curriculum developers in the school board.

Rationale

With all these drawbacks one might ask, "Why do research on syllabics at all?" The answer to that is lengthy. The Inuit child, in growing up and learning how to read, faces a different set of realities than most other western children. His/her writing system is young and tenuous, in a state of flux. Only one hundred twenty-five years old and still in need of standardization, agreement, and refinement, it is a writing system at risk. Tied closely to cultural survival and given celestial approval because of its Biblical heritage, it is nevertheless being challenged. The new world does not like inefficiency. Why teach Inuktitut

reading in syllabics? Inuktitut can be written in Roman script. Why transliterate between Roman and syllabics? Why should the child have to learn two writing systems? Since he/she will have to study in English or French anyway, why not teach them in "qaliujaaqpait" rather then teach them "ᖁᓂᐅᔾᔪᑕᐃᑦ"? So much more efficient! Or is it?

It is of utmost importance to take a close and scrutinizing look at this writing system and see whether or not it is a truly adaptable system, able to integrate that multitude of loan words, the explosive creation of new terminology. It is more important to study it for its relationships to schema formation and the logic it builds.

It is also important to study the syllabic writing system for its learnable qualities, the factors affecting the reading fluency. The school system must maximize the advantages and minimize the disadvantages of the syllabic writing system so as to give this system every opportunity to compete favorably in today's society.

It is equally important to find out how the students adapt to the introduction of a new Roman writing system when they start second language education in grade three. What transition problems are they likely to encounter and how can they be minimized?

Background to the Study

Child Observation in Teacher Training

In 1978, Dr. A. Stairs joined the Kativik School Board to start the Child Observation Project In Teacher Training, COPITT. Since 1978, Kativik School Board, through this COPITT project, has been researching

how the Inuit students learn. This includes some studies on reading readiness, syllabic recognition, and reversal tendencies, etc. Some statistics have been gathered and normed.

This current research will be one additional segment in the overall COPITT program and may give its reading readiness tests, remedial programs, and possible future developments a clearer basis. The tests are intended to provide some statistical information which may help in the continued development of the early Inuktitut reading program at Kativik.

The will of the people

Kativik School Board is an independent school board directed by an Inuk Director General and Inuit Commissioners elected by the local populations. Thus, it is very responsive to the expressed desires and needs of all the local Inuit communities. Mandated under the James Bay Agreement in 1975, it has been given the right to set educational policies and directions independent of the Ministry of Education for Quebec.

Each community also elects an Education Committee which has been given some policy-making priveleges. One of the most important of these policy issues is the "Language of Instruction". With advice over the years from such experts as Drs. Stairs, Cummings, Crago, and Taylor, all local Education Committees and the Kativik School Board endorse a language policy that requires students to begin their formal education in their mother tongue.

It is broadly felt among the Inuit that unless Inuit children learn to use both the spoken and written forms of Inuktitut well, the culture will be at risk.

Percentage figures for literacy in Inuktitut are not available. It is

known, however, that in the Kativik School Board jurisdiction, some ninty-five plus percent of all Inuit use Inuktitut as their first language.

Since written Inuktitut allows for a respository of Inuit literature, concepts inherent in the language, history, and the like, future accessibility would be dependent on the literacy of its people. One could argue for only a recorded body of oral Inuit knowledge, but this has major limitations as well. Probably, bodies of knowledge in combinations of all media would be most profitable for the culture. Since our concern in this thesis is on the ability to learn to read the syllabic characters, we will leave such concerns for other studies.

A Movement towards a Common Orthography

It may also be of some help in the discussion about the advantages and disadvantages of using either of the two orthographies currently in use by the Inuit of northern Canada.[1] While this topic is broad and complex, it is necessary to begin the process of evaluation by establishing some useful data on these orthographies when in actual use. The eventual decisions regarding the use and further development of these orthographies will need to be made by the people themselves. Because of this, it is necessary to provide them with useful information on this matter.

Psycholinguistics as well as common sense has shown that such decisions are not necessarily made on the basis of efficiency in the academic sense of the word, but because of a host of other motivating factors. Some of these are historical. For instance, one reason given for retaining syllabics is that since this orthography was given by God (the earliest writing in syllabics was the Bible), we should not tamper with

it. Other reasons are current and cultural. One of the elements that sets these people apart and allows them to claim a unique cultural legitimacy is their written language. It is visibly different, just as they are visibly different from the "Hadlunaat" (non-Inuit white people). While they recognize that this syllabic writing system is being practiced by the Cree also, the Cree people are also Native, also unique.

Pressures on Inuktitut

On the other side, there are many pressures to "come on stream" with the world at large. "Since most peoples use the Roman orthography why not you?", is a powerful determinant. Until a few years ago, the message of the new technologies was just that. "If you want to make use of these marvelous tools such as our computers, you had just better learn to read and use Roman Inuktitut." The implied message is, "If you want to have the advantages (?) of our Western society, you must become like our Western society."

This is not only a southern perspective. Some Inuit believe that Inuktitut, and especially syllabic Inuktitut, is a language bound by its roots, the highly sophisticated but narrow confines of the traditional hunting society. Luke Palliser, a young computer programmer, is probably representative of a number of young Inuit. In our discussions, sometimes heated, he has expressed his frustrations at syllabic Inuktitut. Luke finds decoding it laborious. It is so dense in content that he must make absolutely certain what each character is or he misreads the text. Thus, he finds Inuktitut slow and cumbersome. He also finds that at the end of a lengthy passage he often has forgotten what the beginning was about. Luke feels quite strongly that besides being cumbersome, the language is

unable to adapt quickly enough to the explosive technological development of their society. Luke believes that the use of the language is limited to interactions in social situations. When the language needs to deal with new technologies, he feels the Inuit should not waste their time but switch to English, as the rest of the world has done (L. Palliser, personal communications, 1987-1990). While we can easily dismiss such an Inuk view of the situation, Luke's basic concern remains whether or not Inuktitut written in syllabics can stand up to the pressures of highly text-oriented technological society. It is a compelling viewpoint.

The Role of the ICI

Yet, there are as many good reasons not to become like the western societies. To give in and join the millions or to stand alone as a small group of twenty thousand amongst the millions is not a one-time decision but a movement that is made up of many decisions. The ICI's choice of orthographies is just one of these choices that will affect the outcome. To be able to make these many choices wisely is the role of the leadership such as the ICI. The Inuit Cultural Institute is totally made up of Inuit concerned with the cutural future of the Inuit people. When the ICI calls together its language commission, it calls upon much outside expertise and information, especially when it comes to making decisions regarding their writing system. Perhaps this paper may help determine the direction their written language will take over the next decade.

Assumptions and Limitations

I based the computer syllabic-recognition and grapheme-reversal test on the following assumptions:

1) Since the test would generally be completed by students prior to learning to read, it would need to be free of instructions or text to be understood.

2) The instructions for the teacher responsible for testing the students would be in Inuktitut only.

3) The test would require minimal learning before being run.

4) The timing allowed for students to respond to the test elements would be ample so as not to intimidate the student.

5) The test should be enjoyable to do.

6) The total test would take only a few minutes to complete so as not to have results affected by fatigue.

7) The school board would allow the writer sufficient time at the summer teacher training session to run a pilot.

8) Also, that they would give the writer a one hour workshop at the Pedagogical days in October, 1989 to introduce teachers to the test procedures, give them hands on experience and distribute the diskettes.

9) The writer also assumed teachers would have computers available to do the testing.

10) Finally, the author assumed an Inuk programmer would be available to help him write the computer program.

A number of limitations were recognized.

1) First, there was the problem that the test had to be ready and in the hands of our teachers at the Pedagogical days in October or it would have to wait a full year before actually being implemented.

2) Also, there was the reality that if teachers ran into problems, they would not have support close at hand and it would be their responsibility to ask for help, something not readily done.

3) The author recognized the limitation of too narrow a testing range. However, due to the fact that it was a new experience for all concerned, he was hesitant to make it too broad. Therefore, it was kept to just one subset of the readiness testing procedure, that of one-syllabic matching. It was the intention to extend the test in future years. This turned out to be a serious error of judgment.

Definition of Terms

Syllabic Orthography refers to a set of symbols used for recording spoken language as first introduced by the Rev. James Evans in 1840. The ICI standardized orthography is made up of 90 full-sized symbols, 14 smaller symbols, and an H and X to use in special instances. (See appendix 1 for the complete set and its approximate phonetic equivalent in Roman.)

Inuit are the people often referred to as Eskimos. In Canada they total some 20,000, of whom 5,500 reside in the region for which the Kativik School Board is responsible. The geographic area over which they are distributed is 5000 kilometers of subarctic coastline in Nouveau Quebec. This region contains 15 settlements along that coast and some 600,000 square kilometers of territory.

Inuktitut is the language spoken by the Inuit.

Hypotheses

The main hypothesis of this paper is that one is able to test young children using a computer programmed test for syllabic grapheme recognition problems and reversal tendencies in syllabic orthographies. The second hypothesis is that the test can be simple enough so it can be completed by pre-schoolers and kindergarten, as well as older students. A third hypothesis is that such test will show which syllabics prove to be more difficult than others for students to recognize correctly and the ages at which correct recognition normally occurs. Lastly, the test can be fun to do.

Summary of Chapter One

Due to the important role that the syllabic orthography plays in the cultural and linguistic survival of the Inuit people, the school system has the responsibility to teach and support this writing system to its best ability. Its graduates must be fluent readers of Inuktitut in syllabics. Of necessity, they must be as efficient as they are in Roman orthographies. The testing procedure we are developing will help identify not only the problems young children may have in recognizing syllabic characters, but also provide additional information to improve the reading programs of the school board.

Footnotes

1. Peterson, R. (1989) . An Evaluation of the Feasibility of a Common Inuttut Orthography. Nuuk, Greenland: University of Nuuk, Ilisimatusarfik.

CHAPTER TWO

Review of the Literature.

Introduction

This chapter is an explanation of the current research relevant to the topic, the processes involved in character recognition and decoding. It describes how the child must develop a three-sided approach to recognizing such symbols. First is a structural understanding of the symbol in spatial terms. Secondly, the reader must link a set of cues to both the symbol and the reader's own mental map of the structure. These help to relate and identify the character that is observed. Thirdly, in Inuktitut a graphophonic relationship is very important. All of these must be clearly established. The orthographic system in use is evaluated in light of these issues. Current testing methods and possible sharing of development efforts are discussed to round out the chapter.

Related Literature

Size of the Syllabary

There appears to be some agreement amongst researchers that alternative writing systems to Roman can have specific advantages over the Roman orthography. The syllabic orthography is one of these. If we look at the syllabic system, we find it has a number of very useful

features. Firstly, it is a true phonetic system. Each symbol stands for a definite sound grouping, most often a consonant and vowel combination. Of these, there are in the Arctic Quebec region forty-two symbols. To provide for a long vowel sound, these same symbols can be written with a lengthener dot over them; thus, we now have 42x2 = 84 symbols. Then, to allow one to write consonant sounds only, these same symbols are reduced to half size and used as diacritics and finals.

This makes the total ninety-eight symbols. Then, if we add the X for Christ and the schla, schli, schlu sounds for the Baffin region, we have a total of one hundred six unique symbols. This seems like a lot of symbols to learn for a young child. Yet, if we recognize that these are the same fifteen symbols in three rotations, with or without lengthener dot and in two sizes, it is not nearly so threatening. In many cases the one-syllabic character contains as much information as three Roman characters.

Thus, a syllabic Inuktitut cluster is visually shorter than a Roman Inuktitut sentence or cluster. If you wish, you can think of it as a more powerful writing system. While traditionally the orthography was open to ambiguity, with the introduction of finals and diacritics and the improved standardization of its usage, much of that argument is no longer valid. Barbara Burnaby, in her paper for the Bilingual Education Project, draws the following conclusions:

1. It may be easier for very young children to manipulate syllables rather than phonemes.

2. Words written in syllabics may be shorter and less complex than those written in the Roman script.

3. Certain grapheme reversals may cause more problems for learners of syllabics than Roman.

4. If students are going from one orthography to a different type (syllabic to official language and vice versa), they will have to learn new material and concepts. However, if the transfer is made from a Native Roman orthography to an official language or vice versa, the risk of confusion of the two systems is much greater." [1]

Simplicity

One of the most important advantages of the syllabic writing system over the Roman system lies in its simplicity, internal logic, and thus its ease of incorporation. "The best education," said Alfred Whitehead, "is to be found in gaining the utmost information from the simplest apparatus." [2] This is a marvelous statement. It would have been true whether Whitehead had said it or not. Thus, it was true for the Rev. Evans whether he knew it or not. Just how relevant this statement is should be evident from the following quotation. "At Norway house, Evans learned the Cree language...he re-examined his syllabic system, modifying it somewhat to suit the peculiarities of the Cree language... The results were amazing. The system was so simple that it could be mastered and literacy acquired in a few hours." [3] Whitehead would have been most pleased.

The Syllabic Versus Other Orthographic Structures.

In the Roman-based orthographies we notice that the spoken language has been reduced to a more basic level. Jakobson and Halle, talking about language, state, "The distinctive features are aligned into simultaneous bundles called phonemes; phonemes are concatenated into sequences; the elementary pattern underlying any grouping of phonemes is the syllable." [4] Thus, what we have here, in English, are phonemes which are in this case sub-units of the syllable. The student learning to read needs to recombine these phonemes into what are hopefully the correct patterns to give him legitimate syllables. Only then can the student combine syllables into words. The syllabic script, whether Cree or Inuktitut, has the advantage that its smallest segment is generally a complete syllable and, while there are consonant phonemes, these are clearly distinguished because of their relatively small size.

Without any real reading into what constitutes a "clear" versus a "confusable" character, it must be stated that for young children the Inuktitut syllabary contains a number of confusing situations. When we study the syllabary we see that the child needs to discriminate between such characters as these:

ᓕ ᓗ ᓚ ᓭ ᓮ ᓯ ᓰ ᓱ ᓲ ᓴ ᓵ ᓶ ᓷ ᓸ ᓹ ᓺ ᓻ ᓼ ᓽ ᓾ ᓿ

That is a possible 19 variations of the same character. For an adult this does not provide much of a problem, even though we do not know to what degree it slows down scanning rate. However, for a child, who needs to consider size, directionality, and complex versus simple

form, this could become a demanding and definitely slowing task. It will be extremely important to determine the most advantageous attack order so as to reduce the numbers of possibilities as rapidly as possible and thus attain the correct stimulus. Leeds agrees:

> Although findings were not consistent, it seems likely that letters function as cues and words composed of non-confusable letters are easier to discriminate and read than words composed of confusable letters.... A study of the distracter errors suggested that letters in the initial position are the most frequently used letter cues. [5]

We must deal first with the structure of the character or, rather, not the character itself but the underlying geometric form. This relates to some experimental results in visual perception. Salapatek and Kessen, in their studies of visual scanning among young infants, discovered that

> Of greatest consequence for perceptual theory, the infants responded to only part of the figure. The ocular orientations of the infants were not distributed haphazardly over the triangle but tended to cluster at the vertices. Not only did their orientations cluster at the vertices; there were extremely few orientations in the center of the triangle, the region in which it would be expected that a substantial number of orientations would lie if the infants were responding to the figure as a whole. [6]

Since the child does not respond to the figure as a whole, it will be necessary to simplify the whole to a unique figure, easily distinguished from the others.

S. Howard Bartley agrees with this conclusion. He states that "whatever depresses or precludes edge formation precludes the full appreciation of the shape." [7]

D.O. Hebb, in his article Summation and Learning in Perception (1968), states that "perception is a summation of cues, gathered in a schematic map, and only after that recognized as a unit." [8] The saccadic eye movement may help to gather those cues. It raises two questions. The first is whether the clarity of the schematic map affects the fluency of character recognition, and the second is how to link to the schematic map with the least number of cues required.

According to some theorists, it should be possible to improve on the child's discrimination of the symbols through a structural approach to his/her recognition.

Steinberg claims that as shown in animal studies, the information available at the higher visual centres is not simply a mapping of the retinal image, but that abstracted features of the symbol can be represented and still recognized.[9] Thus he claims its formal "structure" may be represented and still recognized.

Steinberg points to a specific process in character recognition. Step one is visual template matching. Step two is to test the shape with a features list. Step three is to extract a linked clue or concept, while the fourth step is to match it to an auditory template.

Let's try it with the Δ syllabic.

- We match it as closely as possible to an Δ map in memory
- We test it. Does it have three points?
- We check it against a memory clue. Is it like a tent?

- If so, that means its sound is the English "e" sound.

This is an important theory for the process of teaching reading. For while it is fairly simple to support the theory when dealing with one symbol at the time, it is much more difficult to see that "template process" work for a compound syllabic sight word (i.e., ᐃᓱᒪ).

Thus, while we consider sight-word recognition an important direction towards a grasp of larger written forms, it may be critical to first clearly establish the logic of the characters themselves in the mind of the young reader. Once firmly fixed, this will then always present itself as a logical structure within the compound language forms. This schematic map may help the decoding process in later years. This is considered an important function within reading the Chinese characters.

> The logic of the Chinese script actually makes decoding much less difficult than many instructors have believed. This would be true if the teacher has the knowledge of the development himself, and is able to help the student to see the logic of the structure. [10]

The Japanese also see a structural understanding as an important element of reading. "... There are three dimensions of language education ... spoken ... language activities ... and the third is instruction in the structure of language and Hirgana letters ..." [11] If this is truly a functional factor, we must determine just what constitutes structural understanding and how we can promote this in young children.

Two structural elements play a role here. The first is the structure of the sound as attached to the character, its graphophonic structure. This is an area not addressed here. Yet, this is as important a component of character recognition as the second, which we focus more

readily on, that of the spatiality of the graphic image itself. Thus it is necessary for some researcher to study the structural relationships between the graph and the sound, a graphophonic relationship.

Spatiality or Directionality.

The notion of spatiality or, in two-dimensional term the directionality of the characters, is for the child quite difficult.

> Only the very perceptive adult realizes that there is anything really difficult for the child to learn about space. Piaget and others have made it crystal clear how long it takes the human mind to discover, master and synthesize spatial concepts. [12]

Then why bother? With time the young child will learn the syllabic characters by rote anyway and time spent on reading practice will probably pay off just as much or more than working at developing a spatial understanding, an understandable argument. Yet, what is at stake is not just reading fluency. "Precision in the structure of inner space is one of the firmest foundations for adult rationality." [13] It is thus of critical consequence. The truly subtle and rich understanding of space for the native Inuk, embedded in the language itself, should be one more reason to focus on spatiality and enhance the beginning reading program with this valuable concept. It should be readily available to the young child in a number of ways in his early education.

We must through these various exercises, etc. help tie these spatial understandings directly to logical groupings of characters, those that are spatially related. Without this logical linking of spatial structures to subsets of the orthography, rapid decoding of the graph to its phonetic equivalent will remain slow.

For example, the ᐱᑎᑭ characters, while phonetically different in their consonant value, are related in their vowel sounds. Thus, while the child needs eventually to distinguish between these symbols because of their consonants, she/he can as interim part of the decoding process split them away as a group from all other syllables belonging to the other vowel groups. This is done via their directionality. Thus the ᐱᑎᑭ can be immediately isolated from say the ᐸᑕᑲ or the ᐳᑐᑫ. Another set of cues can then be used to isolate the consonant value. This consistent spatial logic within the orthography, "direction" versus "vowel sound" and "shape" versus "consonant sounds" should be taught in order to facilitate the decoding process.

This type of perceptual training should not come as a surprise. The last halfcentury has placed increasing emphasis on the relationship between rational thought and visual perception. "Montessori's cylinders, Caroline Pratt's blocks ... Cuisenaire rods and the letter-stick methodology ... they are all perceptually oriented and emphasize the importance of our perceptual processes." [14] We must develop the visual perception skills and the translation of these perceptions into alternate forms. For instance, we must give the child ample opportunity to translate perceptions into bodily equivalents. To translate perceptions into drawn forms, into real constructions, into verbal forms, into musical entities. As you can see, we have a great number of translation options. It is important to use as many of these as possible, because in doing so the child will gain an integrated understanding of his visual world, one in which, reading becomes a valuable part. Reading will be understandable but, even more important, it will be relevant to his or her total reality.

Shortcomings

We must not consider the syllabic system to be without fault, however. It has been recognized by many that the syllabary as adopted by the Inuit does not cover all phonetic requirements. At a computer syllabary conference at Kativik School Board Offices, where a number of language experts gathered to discuss the standardization of the Syllabic use of computers, mention was made that we should not be too hasty in fixing the syllabary, in that a further two characters were being considered for inclusion into a revised version of the syllabic script. This was due to the discovery (by white linguists ??) of previously unrecorded sounds. Very likely the Inuit themselves always knew the system lacked a little. In 1965, Gagne discussed the difficulties with the syllabary.

> In considering syllabics, Gagne found that it too, under-differentiated. He over-stated his point however, because he felt that finals were little used and understood by Inuit ... One might argue that a small postsyllabic symbol, prescribed by certain missionaries, standing for a single consonant ... could maintain the distinction. A brief glance at any publication which uses the secondary syllabic symbols will easily illustrate the complexity of such a practice, keeping in mind the minuteness of such symbols and the difficulty of reproducing them by hand. [15]

Thus a solution is possible but this solution (now in practice) does make the Rev. Evans' simplicity a little less simple.

Another point sometimes raised is that of the economy of characters. What is meant here is the economy of the total number of

symbols. Leong calls on Goodman when he considers the issue.

> Goodman is right in pointing out that syllabification has its inherent difficulties. For one thing, over-emphasis on syllabification goes against the principle of economy of the English alphabet as there are many more syllables than there are letters of the alphabet and phonemes. For another, syllabification is not simply going by "what the sound says." [16]

While this may be the case in learning to read Chinese, it is the author's belief that the trade-off in learning and considering 106 characters versus the extra length of Roman scripts, as well as the inconsistencies in languages such as English, and the confusing of phoneme combinations, make the option of the syllabary quite appealing. Mattingly, Erickson, and Turvey, when comparing Chinese and English, believe this to be the case as well.

> Phonetic orthographies like English seem to have two distinct advantages. One is that the number of sound distinctions in any language is small (under 100) so that the number of symbols to be learned is correspondingly small. The other is that, in principle, once the child has learned the idea of path A (phonetic decoding), he can read or write anything that is in his speaking vocabulary. [17]

So much the more for a language in a phonetically consistent script such as Inuktitut

As you can see from the above, the advantages and disadvantages are not at all clear. Yet, one of the aims in teaching reading and writing must be to help students achieve the greatest fluency, understanding, and clarity of expression in their reading and writing. Thus, if we can

establish the advantages of each writing system in the elements that help to make up the fluency, understanding, and clarity, we will provide educators and societal leaders with additional decision-making knowledge.

It is to this end that the writer believes the development of grapheme recognition and reversal tests and the results of its application may also be of some use.

The Role of Anticipation

Skillful anticipation promotes predictability and, in turn, this predictability will enhance confidence of the reader which in, turn, will promote additional speed. One needs only to test oneself to see the truth of this process. This was my personal reaction.

> My confrontation with a text about an unknown subject area happens as follows. I start off in great spirits, my eyes just skimming the introductory page. An abrupt stop, however, unnerves me, for I know I have just misread a whole paragraph. What did it mean? I go back. I read again, slowly. I scan each word carefully for clues I have missed, a word misunderstood. I have lost confidence in my own reading ability! Gradually as I work my way through the text and the jargon starts to be remembered, I start to scan faster, combine faster, jump and speculate.

Anticipation, memory, confidence, and its proof, predictability, all play a very important part in the reading process. The research I am proposing will do nothing to test for this factor of anticipation. However, similar tests could be constructed to test for this element in reading.

School Initiated Ventures

Due to the lack of commercial programs available to test children's reading readiness for syllabic scripts, The Kativik School Board has developed its own set of test (see Appendix 2). Dr. A. Stairs helped the Inuit teachers develop a series of tests based on the Slingerland Pre-Reading Screening Procedures (sub test 1-5) test. They include the following:

1. Visual discrimination (matching),
2. Visual discrimination (matching) with sequence,
3. Visual discrimination (matching) with memory,
4. Visual-motor (copying),
5. Visual-motor (copying) with memory.

These tests have now been in use ten years and have been fully accepted by the teachers in the local settlements as a good indicator for reading readiness. They perform quite well in this function. Since they test only a few combinations of characters, etc., they are, however, not a useful tool in identifying specific perception problems inherent in certain character combinations or even within single characters.

If the computer test can be fully developed and implemented, it may help to give us the type of information not available from the standard set of Kativik-developed tests.

Selected Problems and Directions of Cooperative Programs

Currently, no cooperative programs are available or are planned. It would, however, be a useful set of tests for all groups using syllabic text. Thus, it might be worthwhile to set-up links with the Cree School Board in Quebec. The major drawback to such working together is not in the different needs but, rather, in the different approaches used in the development processes. The Kativik School Board has consistently built all its resources on the principle of a multi-faceted development: people-development simultaneous with material- as well as implementation or program-development. Never one without the other. Thus, teachers are an integral part of the development process right from the start. They are the co-creators of much of the material and are the testers and implementors of the newly developed materials.

This means it is a slow but integrated process, slower than most school authorities would be willing to accept, but a process Kativik School Board is equally unwilling to give up.

Summary of Chapter Two

This chapter tries to look at several aspects of the syllabic orthography in the light of general research on perception as well as the test currently in use by the school board to test for reading readiness. It describes a number of advantages. A syllabic(s) may be easier to manipulate than a syllable made up of several phonemes. Syllabics create a shorter text. It provides a clear separation between native written language and English or French. Among the disadvantages it describes are such things as the directional complexity of rotating a single symbol seven

ways, changes in size, and additions of subunits.

The research shows how a symbol-schematic map may be created. It shows perception to be the linking of a series of cues to this schematic map of the symbol. This symbol may then be directly translated into meaning or it may in turn be attached to a sound structure which is then translated into oral language, then into meaning. Regardless of which procedure is used, it is important to establish a set of clear schematic maps of the symbols and to attach good relevant cues to the map. Thus, a structural approach to character recognition is important not only for fluency but, according to researchers, also to the development of internal logic and spatial concepts in the child.

An explanation of the reading readiness test currently used by Kativik was given and its limitations were noted. Then, the need for but complexity of sharing such developments with other native groups using syllabic scripts and the unique development processes used by Kativik closes this chapter.

Footnotes

1. Burnaby, B. J. & Anthony, R. J. (1979) Orthography Choice for Cree Language in Education. In Working Papers on Bilingualism, No. 17. Toronto: Ontario Institute for Studies in Education.

2. Schiller, H. A. (1971) From Shape to Letter. Main Currents in Modern Thought V28 n2 (p. 10).

3. Harper, K. (1983) Writing in Inuktitut: An Historical Perspective. Inuktitut Magazine 53 9.

4. Jakobson, R., & Halle, M. (1971) Fundamentals of Language. The Hague: Mouton.

5. Leeds, B. G. (1976) Kindergarten Children and the Influence of Letter Shapes and Meaningfulness of Vocabulary as Factors Influencing Word Recognition. (p. 4) Unpublished Research Report.

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11. Muraishi, S. (1976) Orthography and Learning to Decode in Japanese. Research paper presented to the 6th World Congress on Reading. (p. 7).

12. Schiller, H. A. (1971) ibid., (p. 4)

13. Schiller, H. A. (1971) ibid., (p. 8)

14. Schiller, H. A. (1971) ibid., (p. 2)

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17. Liu, S. S. F. (1978) Decoding and Comprehension in Reading Chinese. In D. Feitelson (Ed.), Cross-Cultural Perspectives on Reading and Reading Research. (p. 154). Newark: International Reading Association, Inc..

CHAPTER THREE

The Research Design

Introduction

This chapter will look at the test and testing procedure, its structure, and pre-implementation modifications.

The test is a computer-driven test based on the first of the Slingerland prereading readiness tests. It attempts no more than to assess visual discrimination via the matching of single syllabics on the computer screen. The display of the syllabic to be matched is fixed, while a series of possible matches is displayed for a timed period. The responses of the student are recorded automatically into a dribble file for later analysis. The chapter describes some of the pre-implementation modifications made during and after the summer teacher training sessions in July, 1989.

Approval Committee - Kativik

The Canadian Inuit are probably among the most studied people in the world. The intrigue with these northern, and until recently, somewhat isolated people have made them a prime target group. In the past, many of the studies simply used the people, with little or no benefit to their society. In order to keep research to a manageable level, and to make

certain the data would be used for the welfare of the people, a research committee was established in 1987. This committee now scrutinizes all applications for research within the school jurisdiction. It assesses research proposals on a number of criteria.

It is necessary that the research uses Inuit as part of the project, both on a consultative basis as well as in the research procedures. The school board would like to see Inuit receive training through research involvement. In this way, it hopes that skills and knowledge present in the project become available to Inuit educators. It also believes that if research permission is granted, this research must be directly applicable to the educational system. This is not that they feel pure research is not important but, rather, that the specific needs in the school jurisdiction are so great as to justify directing research to that end. It can, thus, also help to formulate research so that the subsequent results can be cumulative in effect. A prime example of such a tiered research is found in the work of Martha Crago and Shanley Allan. Martha did her doctoral research in identifying early childhood (one to two years of age) language acquisition. Shanley Allen is currently doing an exhaustive study of the same children slightly older. In this way the cumulative data and findings that result will be more useful than such a study in isolation.

Another concern the committee addresses is the amount of research taking place in a particular community. It is quite easy to overload teachers and students with what to the researcher is important work, but which interferes with the school curriculum or possibly creates undue stress for the students. This committee, thus, also oversees this particular effort.

The committee approved this project on the basis that it involved a young Inuk programmer, and that its results could be of benefit in the beginning reading program and perhaps lead to a set of computerized diagnostic tools.

Description of the Population Sample

The intended student population for our test was the Kindergarten and grade one students of the fifteen schools within Kativik School Board. The actual sample depended on the goodwill and comfort of the teachers who needed to work with the test program. During the introduction workshop at our pedagogical days in Inukjuak, October 1989, twenty-one teachers agreed to try the program with their students.

This large a sample could give us data for the total student population and for all our settlements. That, in turn, could give good cross-settlement information and the opportunity to make some general comments about syllabic recognition among young Inuit students, with some environment context references.

This would be especially interesting when cross referencing students of Kujjuaq and Kuujjuarapik, both settlements with a high proportion of non-Inuit people and such places as Aupaluk or Quartaq, which are still strong Inuit settlements.

However, those expectations of participation were highly unrealistic. Several factors affect testing in northern schools. Firstly, we are dependent on our classroom teachers to administer the test. Participation is affected by such things as the high rate of teacher turnover, teachers finding that upon returning to their schools they have

forgotten how to use the program or even forgetting to use the program at all. Then, there are those who simply may have no intentions of doing the test program but will not say so in a workshop setting. There is also the fact that when teachers have a problem with the program, they have no one close at hand whom they can ask for help. Since the test program was in Inuktitut only, white staff was generally unable to help them. As one principal in Kangiqsualujjuaq said, "Next time add English or French instructions or titles in the program, please. I had to help our teacher by trial and error." As you can see, for a classroom teacher there are many more obstacles to completing the test than there are reasons for doing it in the first place.

Instrumentation

Test Elements

The test elements were syllabics chosen from the syllabary because they are representative of a certain visual category of symbols. If we divide the syllabarium into related symbol groupings, we must group those which possess similar structural components that can function as cues. Thus, we group such symbols as ◁ ▷ △ but also with them the < > ∧ and subsequently the ᐸ ᐳ ᐱ. This, because they are structurally similar in that the < > ∧ are simply the unclosed version of the shapes ◁ ▷ △. The student was asked not to respond when a no-match (i.e., ◁ ▷ or ◁ <) appeared on the screen. We asked the student to respond when a match (i.e. ◁ ◁) appeared on the screen.

Formulation of Test Elements

The test elements are arranged so as to cover most of the known cue arrangements. The sets we presented are the following:

SET 1

1
2
3
4

SET 2

1
2
3
4

SET 3

1
2
3
4

SET 4

1
2
3
4

SET 5

1
2
3
4

SET 6

1
2
3
4

SET 7			
	1	ᓀ	ᓂ
	2	ᓀ	ᓀᓂ
	3	ᓀ	ᓀᓂᓂ
	4	ᓀ	ᓀᓀ
SET 8			
	1	ᓯ	ᓭ
	2	ᓯ	ᓯᓭ
	3	ᓯ	ᓯᓯᓭ
	4	ᓯ	ᓯᓯ
SET 9			
	1	ᒪ	ᒧ
	2	ᒪ	ᒪᒧ
	3	ᒪ	ᒪᒪᒧ
	4	ᒪ	ᒪᒪ
SET 10			
	1	ᖃ	ᖅ
	2	ᖃ	ᖃᖅ
	3	ᖃ	ᖃᖃᖅ
	4	ᖃ	ᖃᖃ

Figure 1. Order of the Syllabic Test Elements.

Ordering of Test Elements

The elements are ordered so as to begin with those symbols Mary Elijasiapik thinks to be the simplest symbols to recognize. From there we gradually move to the more difficult ones and, finally, to the complex symbols such as the ᓴᓇᓕ and the ᖃᐃᑭ.

The decision on simplicity of symbols is based on her experience with young students and remedial students. This, then, reflects as closely as possible the situation in the classroom.

Response Mode

The student is required to work independently on the test once she/he has been shown the procedure. This procedure in itself is extremely simple. The student needs to press the space bar when a match appears on the screen. If there is no match, the student may just let the symbol pass. The symbol to be matched stays on the screen three seconds. If the student is going to respond, he/she is required to do so while the symbol is on the screen. The responses are then gathered in a dribble file which can be called up by the teacher or researcher for analysis.

Dribble File Structure

The dribble file is intended to capture all of the student responses, that is, the positive actions as well as the passive responses. The file records the student's name in syllabics, then the student's age in years and months at the time of the test. Then it records all the students responses as "1's" or "0's". The file can be scrutinized after the fact to show where the student pressed the space bar and where the student let the symbols pass. The recording is simple. Starting on the left side of the screen, the symbol that was fixed for four matches is given. Next to it you see the symbols to be evaluated against the first. If it is indeed a match the computer enters a "1". If it is a no-match, the computer enters a "0". The last column contains the student's responses. If the student has pressed the spacebar, as for a match, then the computer will enter a "1". When the student lets the symbol pass without pressing the spacebar as for a no-match then the computer will enter a "0". Thus, any time when two 0's or two 1's are shown side by side, the student was

correct. When the leftmost is a "1" and the students response is a "0", then the student missed a match. When the leftmost is a "0" and the student response is a "1" then the student saw a match where none existed (See Figure 2).

Pilot Testing

The author had the opportunity to try the test with teachers and children in Umiujaq during the teacher-training sessions held during the last two weeks of July and the first two weeks of August. The test group was a number of teachers working on their "Practice in Individualized Instruction", a special education course. This is one of the last courses taken prior to receiving their teaching certification. Since the teacher training is based on an apprenticeship model, these teachers have a number of years of teaching experience by the time they are enrolled in this course. Because of their heavy work load, we agreed to have the teachers come to the computer lab on two separate occasions. The first session would introduce them to the test. During the second they would bring the child who was their student for the course duration and have the child try the test. The students ranged from kindergarten students to youngsters of about ten years of age with learning disabilities. Since the programmer was present at these courses, he would be able to observe the problems encountered firsthand and then make the appropriate changes to the software when back at the board offices in Dorval.

During the first session, we found out that the program that had worked quite well in Dorval would not load properly on the new equipment we had brought up for the computer lab. This equipment dilemma caused us problems from the very beginning to the very end.

The programmer went back at the program that evening and we were able to load it at our second session with the children. The teachers were a little hesitant but gamely went along with the trial test.

We found that the students, all of whom were learning disabled, were able to follow the test procedures without any problems. Their response time to the test in a number of cases was quite slow and these students were confused by the short timing and, because of their slow responses, pressed the "match" key for the next following symbol presented rather then the one they had just seen. At the end of the session each teacher checked the dribble file and made deductions about their particular student, keeping in mind the student's response time problems. The students were put to work at another task and the teachers discussed the test and the changes they felt were necessary.

Modifications

The discussion on modifications focussed on a number of items. First was the requirement for procedure familiarity. Based on this, it was decided to include a section, eight symbols, which the student would start with that would not be recorded. During these, the teacher could explain what the student was to do and the student would then take over, hopefully before the eighth symbol. The second suggestion was to increase the time that the temporary symbols stay on the screen. It was agreed to increase the time to five seconds. The third suggestion that was included in the modifications was to allow the capture of a student response during the blank interval and assign it to the symbol just removed from the screen, since that would most likely be the intended match, to which the student responded, albeit late. Thus, in the revised

version, if the student is going to respond, she/he is required to do so between the moment the match appears on the screen to when the next symbol shows. Thus, even a relatively slow response counts. If the student responds during the one second interval, the previous symbol reappears momentarily to reassure the student.

Summary of Chapter Three

The test that was used is described in some detail. It includes the types of test elements which in this case are a selection of the syllabics that the children need to recognize. The choice of syllabics used was based on the known difficulties that students have with particular symbols from observations by a Inuit special education counselor. The test procedures are outlined, including the response required from the student, which in this case is simply a pressing of the space bar when a symbol match occurs on the screen. The test was piloted and a number of changes were incorporated. These included a warmup period, a lengthened response time and response capture during post display time, the interval between displays.

ᓂᐃᔨᓐ	ᐊᒋᑐᑕᓐ	ᓂᒪᒐᓐ	ᑲᑲᓀᓐ
ᓂᐃᔨᓐ	ᐊᒋᑐᑕᓐ	ᓂᒪᒐᓐ	ᑲᑲᓀᓐ
ᒐ	ᒐ	0	0
		0	0
		0	0
		1	1
ᓴᓴᓴᓴ	ᓴᓴᓴᓴ	0	1
		1	1
		0	0
		0	0
ᑎᑎᑎᑎ	ᑎᑎᑎᑎ	0	0
		0	0
		0	0
		1	1
ᐃᐃᐃᐃ	ᐃᐃᐃᐃ	0	0
		0	0
		1	0
		0	0
ᐳᐳᐳᐳ	ᐳᐳᐳᐳ	0	0
		1	1
		0	1
		0	1

Figure 2. Diagram of Student's Test Results

[Note: Column 1 = syllabic to be matched
Column 2 = matching character
Column 3 = 0 means no computer match / 1 means a computer match
Column 4 = 0 means ne response student / 1 means student matched them.
Therefore a 0/0 is OK a 1/0 is an missed error 0/1 is an match error.]

CHAPTER FOUR

Results

Findings of the Hypotheses

The restated hypotheses of this research study are as follows:

1. that it is possible to test young children using a computer programmed test for syllabic grapheme recognition problems and reversal tendencies in syllabic orthographies

2. that the test can be simple enough so it can be completed by pre-schoolers, kindergarten as well as older students

3. that such a test will show which syllabics prove to be more difficult than others for students to recognize correctly and the ages at which correct recognition normally occurs

4. that the test can be fun to do.

The testing of our students proved to be a failure in a number of ways and a success in others. This needs to be discussed along with the causes, so that further developments of the testing procedure may proceed. To do so, the writer will need to describe the actual procedure beyond the test itself.

First, of the twenty-one teachers who had agreed to do the test with their students, only six actually returned the resulting diskette. This

happened for several reasons. Some teachers probably did not really wish to do the test but would not say so in a workshop format. A number of these teachers did not attend this session by choice. In some cases the technology probably frightened the teacher, even if they had worked with the program at the workshop. In some other instances, no computer was readily available in the school. While in a southern school this might not be a major problem, for an Inuit teacher to go and ask a white teacher to relinquish a piece of equipment is a significant obstacle. A follow-up letter and a phone call by an Inuit secretary did not overcome many of these difficulties.

But an even greater problem in completing the test was the lack of compatibility of the program with the wide variety of equipment used in the schools. During both the summer piloting session and the pedagogical days workshop, the program ran on the Commodore PC10 III computers. The initial loading problem encountered during the summer session having been corrected on the spot by the programmer, the program was assumed to be working correctly. Although file creation problems were encountered at the pedagogical days also, these were corrected on the spot by the programmer. Thus, all was fine, that is, until teachers tried to use it in their home schools. Here the program balked. While it could be run, file creation problems recurred due to the fact that they were using different equipment. Thus, teachers reviewing their students' tests found that they were unable to read the data files. Six teachers returned the completed tests regardless, some with notes. One teacher actually realized that the program had a bug and requested another copy. The replacement copy was sent out after having been tested. The diskette worked fine on the Dorval equipment. It failed again on location. In the

end a way to open the data files and read them was found. The real file problem was not realized until the results were plotted. It then became apparent that the program used the results of the very last student tested and applied the same results to all of those previous tested. This major problem disqualifies any results.

Some of the incidental teacher comments may prove useful. The teachers who returned the diskettes all stated that they found the test to be too easy for their students at the time of testing. Since the test was not applied until November, the students had already been working with the syllabic symbols for some three months. With the display time lengthened in the program and the familiarity of the student with the symbols, the test was no longer testing within a significant range. Thus, according to teacher comments, the test was not useful.

Teachers did state that this way of testing works if the program itself works faultlessly. The principal of Satuumavik school in Kangiqsualujjuaq who assisted the teacher, in her attempts to test her students, wrote that the teacher thought it was a "'good way of testing the students if they are comfortable with the vocabulary and the computer, i.e., they must know what the spacebar is etc.' I think that it is a valid test. My only remark is about the instruction" (H. White, electronic mail correspondence, March 2, 1990). Thus, the computerized testing procedure itself appears to be an acceptable procedure.

Discussion of the Hypotheses

Due to the general failure of the computer program, the discussion of the hypotheses must of necessity be limited.

The hypotheses remain just that, hypotheses waiting to be proved or disproved. Because of the failure to record properly the results, this research has failed to show which syllabics might be more difficult or less difficult for young children to recognize. It is obvious from the teachers' comments that the testing must be done much earlier in the students' school experience and that the test must check for a broader range of skills to be useful for identifying recognition problems or intra-character problems. There is some indication from the comments by the teachers that by November of their kindergarten year, syllabic recognition is no longer a problem for most children if they are given sufficient time to make the match.

This does not mean that young students are truly able to scan and recognize syllabics efficiently, since from our summer pilot project we know that when the character display time is short enough, the recognition limitations do appear. As Judy Macarthur stated in her comments on a draft of this paper, "Often students need to be 'stressed' in order to show up problems" (J. Macarthur, notations on draft paper, April, 1990). With an improved program using varied or shortened timing, this type of testing might still prove beneficial.

The computer testing procedure does make the test less teacher-directed and possibly more objective than the paper tests which the teachers currently use. One of the teachers who did use the computer test said that her students learned how to do the test very quickly. She explained the test once prior to having the student do it and repeated it during the first set of symbols. The students were able to complete the test without further help.

Summary of Chapter Four

This chapter shows how the test failed to prove or disprove the hypotheses. It shows that students are quite capable of doing the test without much training. However, the fact remains that if the technology is faulty, all is a loss. From the comments of the teachers who did use it, by the time the students completed the test, they had already progressed beyond the levels tested. Thus, the test needs to be administered at a very specific time in the student's development. A broader test design would give somewhat greater flexibility as to that timing.

Therefore the hypotheses need to wait for an improved version of the computer test and for a new group of students to be tested before they can be proven or disproven.

CHAPTER FIVE

Summary and Conclusions

Restatement of the Problem

The problem this test and this subsequent paper is meant to address is one aspect in the issue of fluency in reading in the syllabic orthography. This total issue is very broad and much beyond the scope of any one project.

If this project and its continuation can add one useful item to what is a long-term discussion, then it will have been worthwhile. Also, if it aids in the continuing development of the mother-tongue reading program for students in Kativik School Board, then it will have been worthwhile, for the language issue is at the heart of cultural strength and survival. Questioning the validity of the syllabic script needs a basis or background made up of many components of literacy, oral and written. Therefore, the intended outcome of this test, showing with what skill the young students are able to handle the syllabics in written Inuktitut, is of some importance in that discussion. While the test itself has not attained a form and structure that added statistical data as information for that discussion, if we continue its development, it may.

The levels of fluency at which symbols can be recognized may in fact help in the revamping of the reading program, which in turn may help to show educators, parents, and finally politicians that the script and language are fully capable of handling the complex communication needs of the twenty-first century Inuit.

Therefore while this particular testing effort failed, the concept is still valid and useful.

Main Features of the Method

The study used an existing Slingerland based test subset as the test elements in a computerized syllabic recognition test. The test allowed the student to respond to a matching or non-matching of symbols as they appeared on the screen. These results were to be collected in a dribble file for later analysis. This test is only one of the components of the current pre-reading tests given to students to determine when they are ready to start the actual reading program.

Main Findings of the Study

Due to the failure of the computer program to record the results properly, no specific findings based on collected data can be given. However, anecdotal findings are of some use in directing the project further.

We found firstly that the teachers did not need to spend a lot of time instructing the student prior to doing the test. A second finding was that students are quite capable of doing a computerized visual discrimination test of this type without significant help from the teacher during the test. A third interesting finding was that by November most students were able to complete the test without errors. It is a fact that teachers must be comfortable with the technology for them to use it for testing purposes. This comfort level comes from several factors: amount

of time spent with the computer, the reliability of the hardware and the software, and the training provided. When one is all alone, it is a much more secure feeling to use traditional paper and pencil. Teachers who had used the computer test actually found the test quite simple to use. That the students enjoyed doing the test was another encouraging finding.

Other Research Arising from this Project

Understandings

It is important to make a number of suggestions for further work on this and related topics based on these test experiences. These tests cannot be described as totally negative, for they do contain a number of lessons in regards to research work

The first lesson learned is to allow sufficient time for the development processes. A hurried process is fraught with problems for the developer and frustrating for those who have to use the materials. Secondly, with the limited opportunities to contact teachers in the northern communities, it is probably better to work through the special education counselors who travel into settlements to work with youngsters and who help set up individualized instruction programs. People such as Mary and Judy would be of great help in the field testing and also aid in the formation of the testing tools. They have agreed to do so next school term if we wish to continue. Since Mary and Judy annually make about six trips during which they do diagnostic testing of students who have learning disabilities, it means that we must allow at least one calendar year for the development of the tools.

Non-computer Test Version

From our negative experiences with the computer-driven test, we must conclude that unless we have the opportunity to try every combination of equipment and software, we cannot hope to have problem-free testing software for teachers to take back. Therefore, we should develop the test in a non-technological form first. Once this has proven successful and worthwhile, we should assess its usefulness in a high-tech format. If it still seems to be worthwhile, we can then decide to translate it into such a form.

Possible Alternatives to the Computer Based Test

A number of variations of the test could be developed and tested. The simplest would be a set of ordered flash cards which contain matching and non-matching sets of syllabics. The tester shows a card for a specific length of time after which the student indicates sameness or difference by saying "same" ᐊᖏᕆᑦ or ᐊᒃ "no, different". The tester records the results by placing the cards which triggered okay responses to one side, cards which caused errors responses on another pile. After some 40 or 50 cards the tester could repeat the error cards to see if the responses were consistent. The final errors would be recorded on a sheet with student identifiers, name, age in year and month, etc.

Another test could test for visual memory and recognition by showing the two sides of the match consecutively. Again the teacher can replicate the problem combinations to test for student consistency.

The third form could ask the student to draw the flashed syllabic with a large crayon in a test booklet. Students should draw only one syllabic per page. This might be an appropriate testing format for

normally-developing Kindergarten and Grade One students.

As well, the phonetic assignment to the symbol could be tested by having the child voice the sound of symbols in set number four (or same symbols as set three). This would ensure that the graphophonic relationship exists as discussed in chapter two.

A similar set of four tests can also be generated for multiple syllabics groupings. We know that single character recognition is reasonably well-developed because the teachers stated that their students had no apparent problems by November of Grade One. It then becomes important to test for recognition of sight-word root chunks and possibly sight-word modifying chunks.

If it can be proven that several characters together in a meaningful chunk can be effectively scanned and instantaneously recognized as a unit (something akin to the Roman "ing" word endings), then this will give a new impetous to the sight word approach. A greater effort to develop the sight-word method further would result. This, in turn, may lead to modifications of the writing system that would aid in identifying the recognizable chunks. Different size characters or bold versus thin characters for different types of chunks within a language cluster might help such clarification. The use of Roman capital letters is an example of a style change for the sake of clarity in English text. It will be important to test such approaches before presenting them for evaluation to the decision makers. The data resulting from multiple character testing would start that process.

My suggestion is initially to create three tests for single characters and three for multiple sets. These will have a single recording sheet that the tester completes. Field test these sets rigorously before finalizing

their design. Then use them to collect data for two purposes. The first is to identify students who may need additional practice or help in character recognition. The second is to build a body of data for the educational authorities and curriculum developers to use.

Conclusions

It is unfortunate that no usable data was collected from our initial computer test. However, because this project has involved a number of people, it has generated a growing awareness of the urgent need to base our early education decisions on continued research and the accumulated and interpreted data.

As such, it has been of some use now and hopefully in the future.

CHAPTER SIX

Postscript

Additional Post Thesis Information

At the ECOO (Educational Computing Organization of Ontario) conference held April 25-26 1990 in Toronto, I made an exciting discovery in the Autoskill computer software program.

This program consists of a series of diagnostic testing modules called the Autoskill Component Reading Subskills Program. These testing modules form the basis for a Reading Skills Training program for people from Kindergarten to Adult. The modules are as follows:

1. Visual Matching-to-Sample
   Items are presented on the screen along with target item. The task is to match the target item with one of the three visual choices.

2. Auditory-Visual Matching-to-Sample
   Three items are presented on the screen and one is simultaneously presented audibly. The task is to match what is heard with one of the three visual choices.

3. Oral Reading
   The screen content is read aloud.

4. Visual Scanning

   A target item embedded in an array of similar items is underlined. This test is performed using pencil and paper.

Following the testing procedure, the computer automatically generates a profile of the student's strengths and weaknesses and a classification is made according to one of three learning subtype groups:

1. Type O

   Deficit in oral reading of syllables and words.

2. Type A

   Deficit in auditory-visual matching of letters, syllables, and words (poor inter modal association).

3. Type S

   Deficit in sequencing of letters in syllables and words." [1]

This program seems to work well and does exactly that type of testing that is the aim of this thesis. The program can be modified as to test elements, response times, etc. It may provide the testing vehicle for which we have been looking. It has been thoroughly tested by its creators, Dr. Ronald Trites and Dr. Christina Fiedorowicz. Background information on the field testing has been requested. Versions for McIntosh, IBM, and Commodore Amiga computers are available. It is the intention of the author to pursue this avenue further.

Footnotes

1 (1990) Component Reading Subskills Program, a Product Note. (Available from [Autoskill Inc. 103 York St. Ottawa, Can. K1N 5T4])

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I.C.I. STANDARD INUTTITUT SYLLABARY

ᐃ	I	ᐄ	II	ᐅ	U	ᐆ	UU	ᐊ	A	ᐋ	AA	H	
ᐱ	PI	ᐲ	PII	ᐳ	PU	ᐴ	PUU	ᐸ	PA	ᐹ	PAA	ᐠ	P
ᑎ	TI	ᑏ	TII	ᑐ	TU	ᑑ	TUU	ᑕ	TA	ᑖ	TAA	ᑦ	T
ᑭ	KI	ᑮ	KII	ᑯ	KU	ᑰ	KUU	ᑲ	KA	ᑳ	KAA	ᑫ	K
ᒋ	GI	ᒌ	GII	ᒍ	GU	ᒎ	GUU	ᒐ	GA	ᒑ	GAA	ᒡ	G
ᒥ	MI	ᒦ	MII	ᒧ	MU	ᒨ	MUU	ᒪ	MA	ᒫ	MAA	ᒪ	M
ᓂ	NI	ᓃ	NII	ᓄ	NU	ᓅ	NUU	ᓇ	NA	ᓈ	NAA	ᓐ	N
ᓯ	SI	ᓰ	SII	ᓱ	SU	ᓲ	SUU	ᓴ	SA	ᓵ	SAA	ᓭ	S
ᓪ	LI	ᓫ	LII	ᓬ	LU	ᓭ	LUU	ᓕ	LA	ᓖ	LAA	ᓗ	L
ᔨ	JI	ᔩ	JII	ᔪ	JU	ᔫ	JUU	ᔭ	JA	ᔮ	JAA	ᔾ	J
ᕃ	VI	ᕄ	VII	ᕅ	VU	ᕆ	VUU	ᕇ	VA	ᕈ	VAA	ᕽ	V
ᕕ	RI	ᕖ	RII	ᕗ	RU	ᕘ	RUU	ᕚ	RA	ᕛ	RAA	ᕼ	R
ᕿ	QI	ᖀ	QII	ᖁ	QU	ᖂ	QUU	ᖄ	QA	ᖅ	QAA	ᖃ	Q
ᖏ	NGI	ᖐ	NGII	ᖑ	NGU	ᖒ	NGUU	ᖓ	NGA	ᖔ	NGAA	ᙆ	NG
ᖠ	SHLI	ᖡ	SHLII	ᖢ	SHLU	ᖣ	SHLUU	ᖤ	SHLA	ᖥ	SHLAA	ᖦ	SHL

X Christ

PER-READING VISUAL SKILLS

ᑕᑯᐢᓇᓂᐢᑯᑦ ᐃᓕᑦᓯᒥᐅᖏᓐᓄᑦ

1) Visual discrimination (matching)
ᐊᑦᓱᒥᑦᓯᐅᓂᖅ

2) Visual discrimination (matching) with sequence
ᑐᑭᓕᓂᐢ ᐊᑦᓱᒥᑦᓯᐅᓂᖅ

3) Visual discrimination (matching) with memory
ᐊᑦᓱᖏᓂᐢ ᐊᐅᓴᓱᓯᐊᑦᓂᖅ

4) Visual-motor (copying)
ᑕᑯᐢᓇᓯᓂ ᐊᑦᓱᓕᐅᕆᓂᖅ

5) Visual-motor (copying) with memory
ᑕᑯᓴᐅᑦᑦᓯᓂ ᐊᑦᓱᓕᐅᕆᓗᓯᐊᑦᓂᖅ

NAME: _____
ᐊᑎᖏᒻ

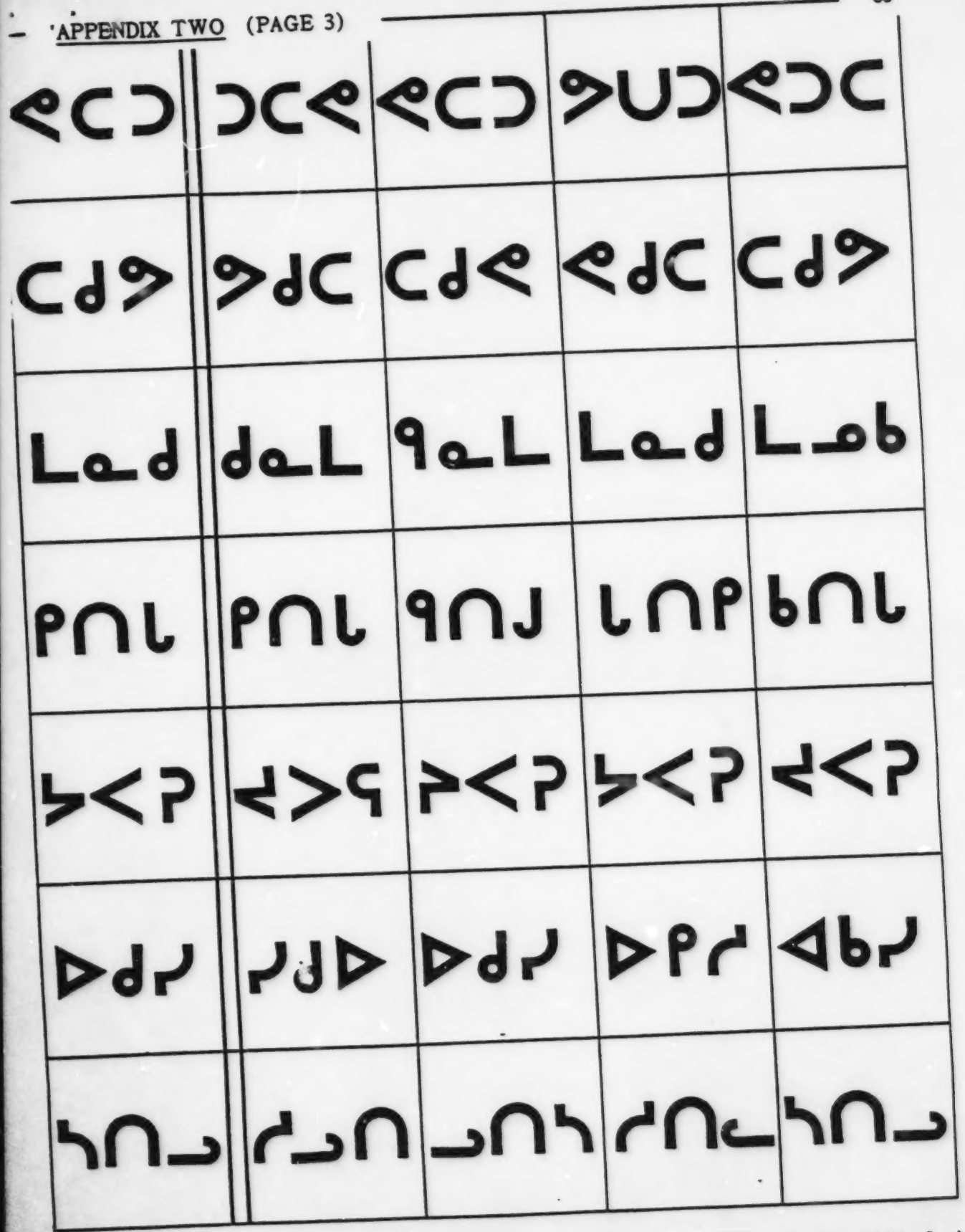
DATE: _____
ᑐᑦᔨᖏᒻ

(Adapted from Slingerland Pre-Reading Screening Procedures, subtests 1 to 5)

TEST I

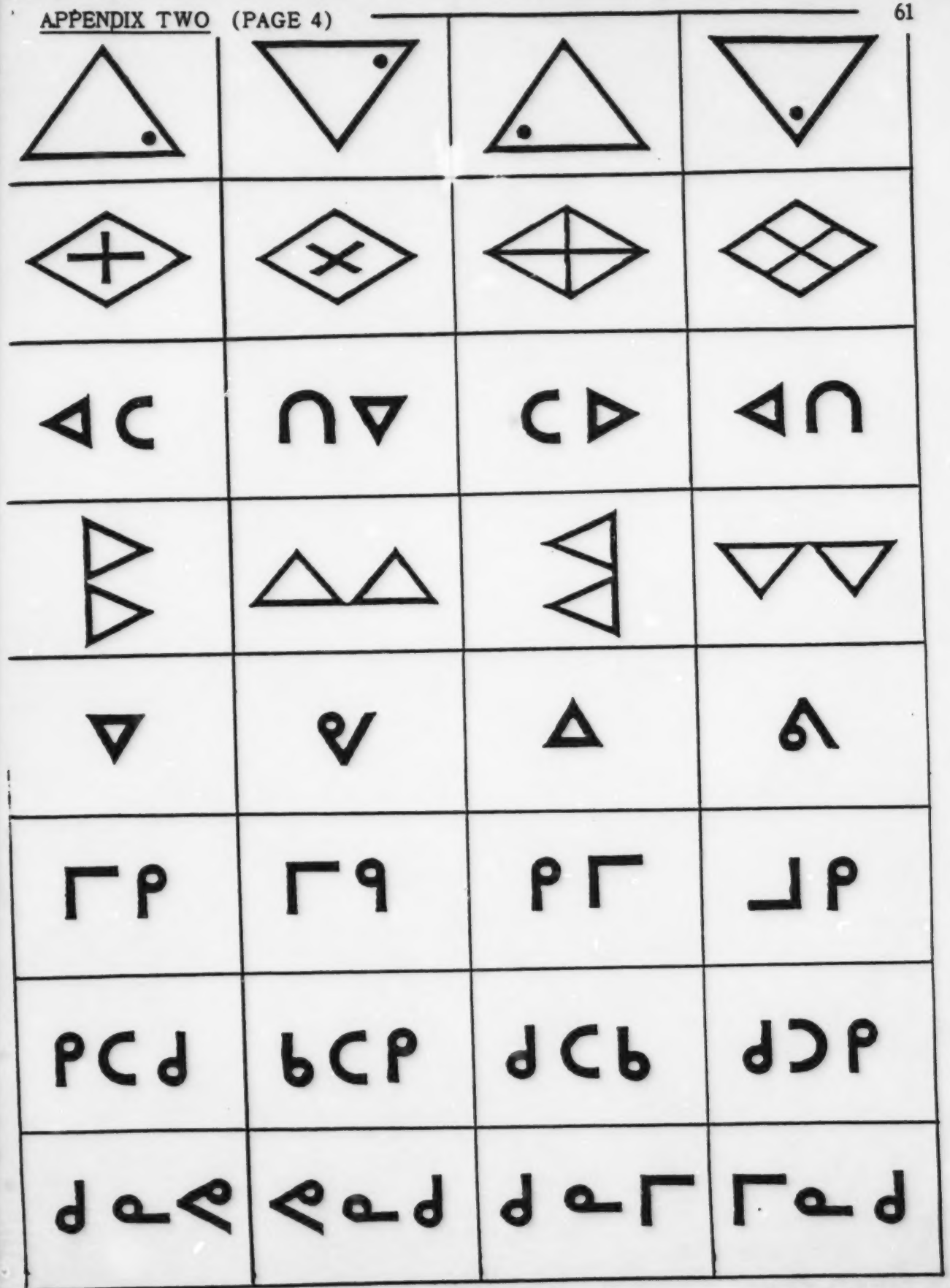
Number Right ( )

APPENDIX TWO (PAGE 3)



TEST II

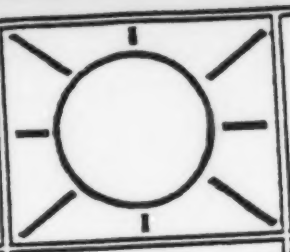
Number Right ( )



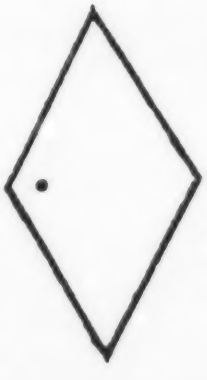
TEST III

Number Right ( )

APPENDIX TWO (PAGE 5)



23



Number Right (

TEST IV

TEST V
Total 10

NUMBER RIGHT ( )
Wrong ( ) Not Done ( )

APPENDIX THREE

Main Testing Program Written in GWbasic

Inuk.bas

```
1+Y),2:NEXT:NEXT:NEXT
10 KEY OFF:RANDOMIZE TIMER:KEY 1,CHR$(12)+"screen 1"+CHR$(13)+CHR$(12):KEY 2,CHR
$(12)+"screen 2"+CHR$(13)+CHR$(12)
15 C1$="ABCDEFGHIJKLMNOPQRSTUVWXYZ":C2$="  ┤":C3$=" /
()$ +=?└X"
20 DIM CUR(25),OCU(25),A$(50),S$(255),X(255),Y(255),M$(99),S(55),P(50),Q(50),NEV
(2850),SCR(324)
30 DEF FNP=INT(RND*4)*3+1:DEF FNQ=INT(RND*4):DEF FNR=INT(RND*3):GOSUB 5000
40 OPEN "R",#1,"s-file",185
50 FIELD #1,128 AS MM$,55 AS NN$,2 AS F$
55 REM:F=1:LSET F$=MKI$(F):LSET MM$="  ┤ ─":P
UT #1,1
60 GOSUB 200
70 CLS:SCREEN 2:LOCATE 3,6:PRINT"┤":LOCATE 6,3:PRINT"1.    ":LOCATE 8,3:P
RINT"2.  ":LOCATE 10,3:PRINT"3.  ":LOCATE 13,6:PRINT"  (1-2-3)"
:LOCATE 16,6
80 A$=INKEY$:IF A$="" THEN 80 ELSE GOSUB 7010:IF A$="1" THEN GOTO 2000 ELSE IF A
$="2" GOTO 100 ELSE IF A$="3" THEN SYSTEM ELSE IF A$="c" THEN T=9:GOTO 80
85 IF T=9 AND A$="s" THEN GOTO 500
90 FOR T=1 TO 3:FOR P=1 TO 2:LOCATE 13,19+T*2:PRINT" ":FOR O=1 TO 150:NEXT:LOCAT
E 13,19+T*2:PRINT CHR$(T+48):FOR O=1 TO 50:A$=INKEY$:NEXT:NEXT:NEXT:GOTO 80
100 CLS:SCREEN 1:A=0:X=7:Y=5:N$=" ":N=0:LOCATE 3,7:PRINT"  └  Esc":DRAW"
bm148,13r30d12130u12":LOCATE 5,1:PRINT"┤  :":LINE(48,32)-(55,39),3,B:PAINT(50,
34),3,3
105 GET(48,32)-(55,39),CUR:PUT(48,32),CUR:LOCATE 1,5:GOTO 130
110 X=7:Y=7:A=0:LOCATE 7,1:PRINT"  :":LOCATE 10,7:PRINT"└  └":DRAW"b
m176,74d219e2d4h2bm139,70r16d12116u12br24r18d12118u12"
130 LOCATE Y,X:IF A$(A)<>"" AND A$(A)<>" " THEN GET(X*8-8,Y*8-8)-(X*8-1,Y*8-1),O
CU:PUT(X*8-8,Y*8-8),OCU,PRESET ELSE PUT(X*8-8,Y*8-8),CUR
140 A$=INKEY$:IF A$="" THEN 140 ELSE IF A$=CHR$(27) THEN 70
143 REM GOSUB 7000
145 IF ASC(A$)=8 THEN IF X>7 THEN LOCATE Y,X:PRINT" ":X=X-1:LOCATE Y,X:FOR T=A T
O 8:A$(T-1)=A$(T):A$(T)=" ":PRINT A$(T-1);:NEXT:PRINT" ":A=A-1:GOTO 130 ELSE IF
N=1 THEN GOTO 195 ELSE PUT(X*8-8,Y*8-8),CUR:GOTO 130
150 IF A$=CHR$(0)+"M" THEN IF (A<30 AND N=0) OR (A<7 AND N=1) THEN GET(X*8-8,Y*8
-8)-(X*8-1,Y*8-1),OCU:PUT(X*8-8,Y*8-8),OCU,PRESET:X=X+1:A=A+1:GOTO 130 ELSE GOTO
 140
155 IF A$=CHR$(0)+"K" THEN IF A>0 THEN GET(X*8-8,Y*8-8)-(X*8-1,Y*8-1),OCU:PUT(X*
8-8,Y*8-8),OCU,PRESET:X=X-1:A=A-1:GOTO 130 ELSE GET(X*8-8,Y*8-8)-(X*8-1,Y*8-1),O
CU:PUT(X*8-8,Y*8-8),OCU,PRESET:GOTO 130
160 IF ASC(A$)<>13 THEN GOTO 180 ELSE T=0:IF N=1 THEN IF A$(0)="└" AND A=1 THEN
GOTO 400:ELSE GOTO 170
165 IF A$(T)=>CHR$(146) THEN 175 ELSE IF T=8 THEN GOTO 140 ELSE T=T+1:GOTO 165
170 IF A$(T)>"/" AND A$(T)<":" THEN 175 ELSE GOTO 140 ELSE T=T+1:GOTO 170
175 GET(X*8-8,Y*8-8)-(X*8-1,Y*8-1),OCU:PUT(X*8-8,Y*8-8),OCU,PRESET:FOR T=0 TO 8:
N$=N$+A$(T):A$(T)="":NEXT:B=0:N=N+1:IF N=1 THEN F=T:FOR O=LEN(N$) TO 48:N$=N$+CH
R$(28):NEXT:GOTO 110 ELSE A=0:N=0:FOR O=LEN(N$) TO 54:N$=N$+CHR$(28):NEXT:GOTO 3
00
```

```
180 GOSUB 7000:IF N=0 AND ASC(A$)<146 AND A$<>" " THEN GOTO 140
185 IF (A<30 AND N=0) OR (A<6 AND N=1) THEN PRINT A$:A$(A)=A$:X=X+1:A=A+1:IF A>8
 THEN B=B+1 ELSE DRAW"":ELSE GOTO 140
190 GOTO 130
195 PUT(X*8-8,Y*8-8),CUR:N=0:Y=5:FOR T=2 TO F:A$(T-2)=MID$(N$,T,1):NEXT:A=T-2:X=
A+7:B=A:N$=" ":GOTO 130
200 GET #1,1:MM$="L - L"+MM$:O=1:P=1:FOR T=1 TO 50:IF MID$(MM$,T,1)<>"" THE
N IF T=P THEN A$=MID$(MM$,T,1):P=T+5 ELSE P(O)=ASC(MID$(MM$,T,1)):Q(O)=ASC(A$):O
=O+1
210 NEXT:SCREEN 1:RETURN
300 CLS:M$="":O=4:FOR T=1 TO 40
305 IF LEFT$(M$(0),1)=CHR$(255) THEN T=ASC(RIGHT$(M$(0),2)):M$(0)="/":IF P<=4 TH
EN O=4 ELSE IF P<=8 THEN O=8 ELSE IF P<=12 THEN O=12 ELSE IF P<=16 THEN O=16 ELS
E IF P<=20 THEN O=20 ELSE IF P<=24 THEN O=24 ELSE IF P<=28 THEN O=28
310 DRAW"c3bm110,70"+S$(Q(T)):TIME$="0":PAINT(110+X(Q(T)),70+Y(Q(T))),3,3:M$(T)=
CHR$(Q(T))
315 IF (T=1 OR T=5 OR T=9 OR T=13 OR T=17 OR T=21 OR T=25 OR T=29 OR T=33 OR T=3
7) AND TIME$<"00:00:05" THEN GOTO 315
320 DRAW"c3bm160,70"+S$(P(T)):PAINT(160+X(P(T)),70+Y(P(T))),3,3:M$(T)=M$(T)+CHR$
(P(T))
330 TIME$="0":IF P(T)=Q(T) THEN M$(T)=M$(T)+"1" ELSE M$(T)=M$(T)+"0"
340 A$=INKEY$:IF A$<>CHR$(13) AND TIME$<"00:00:05" AND A$<>" " AND A$<>CHR$(27)
THEN GOTO 340 ELSE IF TIME$=>"00:00:01" THEN PT=TIMER
345 IF A$=CHR$(27) THEN N$=CHR$(255)+RIGHT$(N$,54):M$(T)=M$(T)+CHR$(0):GOTO 375
350 IF A$=" " THEN IF LEN(M$(T))<4 THEN M$(T)=M$(T)+"1":LINE(154,65)-(190,95),3,
B:GOSUB 850:PT=TIMER:GOSUB 800:GOTO 340 ELSE GOTO 340 ELSE IF LEN(M$(T))<4 THEN
M$(T)=M$(T)+"0"
355 IF T=0 THEN CLS:ELSE VIEW(154,65)-(190,95):CLS:VIEW
357 IF A$=CHR$(13) THEN PT=TIMER+.3:GOSUB 800:GOTO 365
360 IF TIMER-PT<.7 THEN A$=INKEY$:IF A$=" " THEN DRAW"c3bm110,70"+S$(Q(T)):PAINT
(110+X(Q(T)),70+Y(Q(T))),3,3:DRAW"c3bm160,70"+S$(P(T)):PAINT(160+X(P(T)),70+Y(P(
T))),3,3:M$(T)=LEFT$(M$(T),3):GOTO 350 ELSE IF A$=CHR$(27) THEN GOTO 345 ELSE GO
TO 360
365 IF T=0 THEN O=T+4:SOUND 6000,.03:SOUND 37,.03:SOUND 6000,.03:SOUND 37,.03 EL
SE SOUND 4000,.03:SOUND 2000,.03:REM view(159,70)-(185,90)
370 NEXT
375 FOR T=1 TO 8:M$(T)="":NEXT:FOR T=9 TO 40:M$=M$+M$(T):M$(T)="":NEXT:GET #1,1:
IF M$(0)<>"/" THEN F=CVI(F$):F=F+1:LSET F$=MKI$(F):PUT #1,1 ELSE M$(0)=""
380 LSET F$=MKI$(F):LSET NN$=N$:LSET MM$=M$:PUT #1,F:GOTO 100
400 A=0:P=0:X(0)=99:GET #1,1:F=CVI(F$):FOR T=2 TO F:GET #1,T:IF ASC(NN$)=255 THE
N S$(P)=NN$:Y(P)=T:P=P+1
410 NEXT:IF P=0 THEN LOCATE 12,6:A$="L ":FOR T=1 TO 12:PRINT MID$(A$,T
,1);:FOR O=1 TO 350:NEXT:NEXT:GOSUB 5000:FOR T=1 TO 2000:NEXT:GOTO 70
415 FOR T=0 TO P:IF MID$(S$(T),2,31)=MID$(N$,2,31) THEN X(A)=T:A=A+1
420 NEXT:IF A<>1 THEN GOTO 440 ELSE T=0
425 GET #1,Y(T):F=Y(T):P=1:O=0:N$=" "+RIGHT$(NN$,54):FOR T=1 TO 128 STEP 4:M$(P)
="":FOR O=0 TO 3:M$(P)=M$(P)+MID$(MM$,T+O,1):IF MID$(MM$,T+O,1)=CHR$(0) THEN 435
430 NEXT:P=P+1:NEXT
435 M$(0)=CHR$(255)+MKI$(INT(T/4)+1):GOSUB 5000:GOTO 470
440 IF A<>0 THEN GOTO 460
445 VIEW(0,61)-(319,186):CLS:VIEW:LINE(11,61)-(316,186),3,B:FOR T=0 TO P:LOCATE
T+9,3:PRINT RIGHT$(S$(T),6);LEFT$(S$(T),30):NEXT:LOCATE T+8,3:S$(P)=          "
  L ******                                    *******"
450 PRINT RIGHT$(S$(P),6);LEFT$(S$(P),30):LOCATE T+10,10:PRINT" -":Y=(
T+10)*8-6:DRAW"bm190,-y:d219e2d4h2b14bu6r18d12118u12":GOTO 900
```

```
460 VIEW(0,61)-(319,186):CLS:VIEW:LINE(11,61)-(316,186),3,B:FOR T=0 TO A-1:LOCAT
E T+9,3:PRINT RIGHT$(S$(X(T)),6);LEFT$(S$(X(T)),30):NEXT:T=T+1:LOCATE T+8,3:S$(P
)=                " L ******                                    *******":X(A)=P
465 PRINT RIGHT$(S$(X(A)),6);LEFT$(S$(X(A)),30):LOCATE T+10,10:PRINT" -
":Y=(T+10)*8-6:DRAW"bm190,=y;d219e2d4h2b14bu6r18d12118u12":P=A:GOTO 900
470 TIME$="0":S$(0)=TIME$:T=52:CLS:DRAW"bm135,70"+S$(T):PAINT(135+X(T),70+Y(T)),
3,3
475 IF ASC(RIGHT$(TIME$,1))<ASC(RIGHT$(S$(0),1))+1 THEN 475
480 A$=INKEY$:IF T=48 OR A$<>"" THEN CLS:SOUND 6000,.03:SOUND 37,.03:SOUND 6000,
.03:SOUND 37,.03:GOTO 300
485 T=T-1:CLS:DRAW"bm135,70"+S$(T):PAINT(135+X(T),70+Y(T)),3,3
490 S$(0)=TIME$:SOUND 4000,.03:SOUND 2000,.03:GOTO 475
500 CLS:SCREEN 1:FOR Y=4 TO 84 STEP 80:FOR X=59 TO 227 STEP 56:LINE(X,Y)-(X+32,Y
+64),2,B:LINE(X+16,Y)-(X+16,Y+64),2:FOR Y1=16 TO 52 STEP 16:LINE(X,Y1+Y)-(X+32,Y
1+Y),2:NEXT:NEXT:NEXT
505 LOCATE 22,9:PRINT"END  press (return)":LINE(59,164)-(91,180),2,B:GOSUB 700:P
=1:Q=0:Y=5:O=Y:X=60:LINE(X,Y)-(X+14,Y+14),3,B:C=3:GOSUB 510:GOTO 515:FOR T=1 TO
99:M$(T)="":NEXT:GOTO 700
510 FOR T=Y TO Y+48 STEP 16:LINE(X,T)-(X+14,T+14),C,B:NEXT:RETURN
515 A$=INKEY$:IF A$="" THEN 515
520 IF ASC(A$)=0 THEN GOTO 550
525 IF A$=CHR$(27) THEN GOSUB 5000:GOTO 70
530 LOCATE CINT((Y+3)/8)+1,CINT((X+3)/8)+1:PRINT A$:IF X=60 OR X=116 OR X=172 OR
 X=228 THEN C=CINT((O+3)/8)+3:FOR T=C TO C+4 STEP 2:LOCATE T,CINT((X+3)/8)+1:PRI
NT A$:NEXT
535 IF ASC(A$)<146 THEN LOCATE CINT((Y+3)/8)+1,CINT((X+3)/8)+1:PRINT" ":IF X=60
OR X=116 OR X=172 OR X=228 THEN C=CINT((O+3)/8)+3:FOR T=C TO C+4 STEP 2:LOCATE T
,CINT((X+3)/8)+1:PRINT" ":NEXT:GOTO 515
540 M$(P)=A$:IF Q=0 THEN GOTO 515 ELSE RETURN
545 IF Q=0 THEN GOTO 515 ELSE IF Q=92 THEN GOTO 525 ELSE RETURN
550 IF A$<>CHR$(0)+"H" AND A$<>CHR$(0)+"K" THEN GOTO 590
555 IF X=60 AND Y<54 THEN Y=5:LINE(X,Y)-(X+14,Y+14),0,B:C=0:GOSUB 510:LINE(X,Y)-
(X+14,Y+14),,B:C=3:GOSUB 510:GOTO 515
560 LINE(X,Y)-(X+14,Y+14),0,B
565 IF X=60 AND Y<54 THEN 515
570 IF X=60 OR X=116 OR X=172 OR X=228 THEN C=0:Y=O:GOSUB 510:X=X-40:Y=Y+64
575 P=P-1:Y=Y-16:IF X<60 THEN X=244:Y=53:O=5
580 IF Y=69 OR Y<2 THEN Y=O:X=X-16:C=3:GOSUB 510:Y=O
585 GOTO 615
590 IF A$<>CHR$(0)+"P" AND A$<>CHR$(0)+"M" THEN GOTO 515
595 LINE(X,Y)-(X+14,Y+14),0,B
600 IF X=60 OR X=116 OR X=172 OR X=228 THEN C=0:Y=O:GOSUB 510:X=X+16:Y=Y-16
605 P=P+1:Y=Y+16:IF X=244 THEN IF Y=69 THEN X=60:Y=85:O=Y:C=3:GOSUB 510 ELSE IF
Y=149 THEN GOTO 620:LINE(X,Y)-(X+14,Y+14),,B:GOTO 545
610 IF Y=69 OR Y=149 THEN Y=O:X=X+40:C=3:GOSUB 510
615 LINE(X,Y)-(X+14,Y+14),,B:GOTO 545
620 LINE(60,165)-(90,179),3,B:DRAW"bm104,178r38":IF Q>0 THEN 645
625 A$=INKEY$:IF A$="" THEN GOTO 625
630 IF A$<>CHR$(13) THEN LINE(60,165)-(90,179),0,B:Y=133:LINE(X,Y)-(X+14,Y+14),,
B:DRAW"c0bm104,178r38":GOTO 515
635 X=60:Y=5:O=Y:P=1:LINE(X,Y)-(X+14,Y+14),,B:C=3:GOSUB 510:FOR Q=1 TO 40:IF M$(
Q)<CHR$(145) THEN LINE(60,165)-(90,179),0,B:DRAW"bm104,178r38":Q=0:GOTO 515
640 GOSUB 595:NEXT
645 M$="":FOR T=1 TO 40:M$=M$+M$(T):NEXT:GET #1,1:F=CVI(F$):LSET MM$=M$:LSET F$=
MKI$(F):PUT #1,1
650 GOSUB 200:GOTO 70
```

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700 LOCATE 10,9:A$="Recruit Old Data ? y/n":FOR T=1 TO 22:PRINT MID$(A$,T,1);:FO
R O=1 TO 50:NEXT:NEXT
710 A$=INKEY$:IF A$="" THEN GOTO 710
715 IF A$=CHR$(27) THEN GOSUB 5000:GOTO 70
720 IF A$<>"n" AND A$<>"N" AND A$<>"Y" AND A$<>"y" THEN FOR T=1 TO 2:LOCATE 10,2
8:PRINT"   ":FOR O=1 TO 150:NEXT:LOCATE 10,28:PRINT"y/n":FOR O=1 TO 200:NEXT:NEX
T:GOTO 710
725 LOCATE 10,9:PRINT"                                    "
730 IF A$="n" OR A$="N" THEN RETURN
735 GET #1,1:FOR T=1 TO 40:S$(T)=MID$(MM$,T,1):NEXT
740 X=60:Y=5:O=Y:P=1:Q=1:A$=S$(1):GOSUB 525:FOR Q=2 TO 40
745 A$=S$(Q):GOSUB 595:GOSUB 525:NEXT
750 LINE(X,Y)-(X+14,Y+14),0,B:RETURN
800 IF TIMER-PT<.2 THEN GOTO 800
803 IF A$=" " THEN B$=INKEY$:IF B$="" THEN GOTO 840 ELSE DRAW"c3bm96,119r110fd3g
1110hu3e":PAINT(97,120),3,3:GET(95,119)-(207,125),NEV:X=95:Y=119
805 IF A$=CHR$(13) THEN B$=INKEY$:IF B$="" THEN 840 ELSE DRAW"c3bm256,74d9125d5h
7e7d5r20u5r5":PAINT(255,75),3,3:GET(224,74)-(256,88),NEV:X=224:Y=74
810 B$=INKEY$:IF B$="" THEN GOTO 840
820 PT=TIMER:E=E+1:IF(E AND 1)=1 THEN PUT(X,Y),NEV:B$=INKEY$:B$=INKEY$
830 IF TIMER-PT<.12 THEN 830 ELSE GOTO 810
840 IF POINT(97,120)=3 OR POINT(255,75)=3 THEN PUT(X,Y),NEV,XOR:E=0:RETURN ELSE
RETURN
850 TIME$="0"
860 B$=INKEY$:IF TIME$<"00:00:01" THEN 860 ELSE RETURN
900 LOCATE 9,1:PRINT CHR$(26):T=0
905 A$=INKEY$:IF A$="" THEN 905 ELSE LOCATE T+9,1:PRINT" "
910 IF A$=CHR$(0)+"H" OR A$=CHR$(0)+"K" THEN T=T-1:IF T<0 THEN T=P:GOTO 930 ELSE
 GOTO 930
915 IF A$=CHR$(13) THEN GOTO 940
920 IF A$=CHR$(27) THEN GOSUB 5000:GOTO 100
925 T=T+1:IF T>P THEN T=0
930 LOCATE T+9,1:PRINT CHR$(26):LOCATE T+9,3:PRINT"
      ":LOCATE T+9,3:IF X(0)=99 THEN PRINT RIGHT$(S$(T),6):LEFT$(S$(T),30):GOT
O 905
935 PRINT RIGHT$(S$(X(T)),6):LEFT$(S$(X(T)),30):GOTO 905
940 IF T=P THEN GOSUB 5000:GOTO 100
950 GOTO 425
1000 CLS:SCREEN 2:LOCATE 1,4:PRINT"SYLL      MATCH     CORRECT    CHILD"
1010 LOCATE 2,4:PRINT"1.         SYLL.     RESPONSE  RESPONSE"
1020 DRAW"BM0,18R319BM0,0D199BM80,0D199BM160,0D199BM240,0D199BM319,0D199"
1030 A$="  01":FOR T=4 TO 23:LOCATE T,5:PRINT LEFT$(A$,1):LOCATE T,15:PRINT MID$
(A$,2,1):LOCATE T,25:PRINT MID$(A$,3,1):LOCATE T,35:PRINT RIGHT$(A$,1):NEXT:LOCA
TE 10,1
1090 A$=INKEY$:IF A$="" THEN 1090 ELSE END
1200 R=0:FOR P=1 TO 13 STEP 4
1205 O=4:P(P)=FNP
1210 IF P-O<0 THEN GOTO 1220
1215 IF P(P)=P(P-O) THEN GOTO 1205 ELSE O=O+4:GOTO 1210
1220 Q(P)=P(P)+FNR:FOR T=1 TO 3:P(P+T)=P(P):Q(P+T)=Q(P):NEXT:NEXT
1225 T=0:FOR P=1 TO 16
1230 O=1:Q=FNQ:IF Q<3 THEN P(P)=P(P)+Q:GOTO 1245
1235 IF 8=(T AND 8) THEN GOTO 1230
1240 Q=FNP:IF Q<>P(P) THEN P(P)=Q+FNR:L=P:T=T OR 8 ELSE U=U+1:GOTO 1240
1245 IF P-O-R<1 THEN GOTO 1255
1250 IF P(P)=P(P-O) THEN P(P)=P(P)-Q:GOTO 1230 ELSE O=O+1:GOTO 1245
1255 T=T+1:IF (T AND 7)=4 THEN T=0:R=R+4
1260 NEXT:END
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1300 CLS:M$="":FOR T=1 TO 16:DRAW"bm110,70"+S$(S(Q(T))):TIME$="0":PAINT(110+X(S(
Q(T))),70+Y(S(Q(T)))),3,3:M$(T)=CHR$(S(Q(T)))
1310 IF (T=1 OR T=5 OR T=9 OR T=13) AND TIME$<"00:00:01" THEN GOTO 310
1320 DRAW"bm160,70"+S$(S(P(T))):PAINT(160+X(S(P(T))),70+Y(S(P(T)))),3,3:M$(T)=M$
(T)+CHR$(S(P(T)))
1330 TIME$="0":IF P(T)=Q(T) THEN M$(T)=M$(T)+"1" ELSE M$(T)=M$(T)+"0"
1340 A$=INKEY$:IF A$<>CHR$(13) AND TIME$<"00:00:02" AND A$<>" " THEN GOTO 340
1350 IF A$=" " THEN IF LEN(M$(T))<4 THEN M$(T)=M$(T)+"1":LINE(154,65)-(190,95),3
,B:GOTO 340 ELSE GOTO 340 ELSE IF LEN(M$(T))<4 THEN M$(T)=M$(T)+"0"
1360 IF T=4 OR T=8 OR T=12 THEN CLS:SOUND 6000,.03:SOUND 37,.03:SOUND 6000,.03:S
OUND 37,.03 ELSE VIEW(154,65)-(190,95):CLS:VIEW:SOUND 4000,.03:SOUND 2000,.03:RE
M view(159,70)-(185,90)
1370 NEXT:FOR T=1 TO 16:M$=M$+M$(T):M$(T)="":NEXT:GET #1,1:F=CVI(F$):F=F+1:LSET
F$=MKI$(F):PUT #1,1
1380 LSET F$=MKI$(F):LSET NN$=N$:LSET MM$=M$:PUT #1,F:GOTO 100
2000 CLS:SCREEN 2:PRINT"┤:                                                    :"
2010 LOCATE 3,3:PRINT"  ┐              ┐     "
2020 DRAW"bm0,13d176ru176bm56,13d176bm112,13d176bm168,13d176bm224,13d176ru1761d1
761222bm0,26r224bm0,13r224"
2030 DRAW"bm248,13d176ru176bm304,13d176bm360,13d176bm416,13d176bm472,13d176ru176
1d1761222bm248,26r224bm248,13r224"
2040 LOCATE 18,63:PRINT"Ecs   "
2050 GET(0,0)-(473,189),NEV:LINE(477,30)-(635,114),,B
2060 GET #1,1:IF F$<CHR$(2) THEN LOCATE 13,26:A$="":FOR T=1 TO 9:PRINT
MID$(A$,T,1);:FOR O=1 TO 150:NEXT:NEXT:FOR T=1 TO 3000:NEXT:GOTO 70
2100 O=1:A=5:P=0:GET #1,1:F=CVI(F$):LOCATE 3,61:PRINT"- 1 ":LOCATE 16,62:P
RINT F-1;" ":FOR T=2 TO F:GET #1,T:S$(T-1)=NN$:NEXT
2105 FOR T=1 TO 10:IF T<F THEN LOCATE T+4,62:PRINT LEFT$(S$(T),18):X(T)=ASC(S$(T
))
2110 NEXT:LOCATE 5,51:DRAW"c0bm416,30d11":PRINT"  ":LINE(394,31)-(464,41),
,B:GET(394,31)-(465,41),CUR:LOCATE 5,61:PRINT"-":PUT(394,31),CUR:DRAW"c3bm416,30
d11":IF X(O-P)=32 THEN GET(394,A*8-9)-(464,A*8+1),OCU:PUT(394,A*8-9),CUR,PSET:X(
19)=1
2115 A$=INKEY$:IF A$="" THEN GOTO 2115 ELSE IF A$=CHR$(27) THEN GOTO 70:REM 151
to 71 : 143 to 63 : 71 to 111 : 63 to 103
2117 IF X(19)=1 THEN X(19)=0:PUT(394,A*8-9),OCU,PSET
2120 IF A$=CHR$(0)+"H" THEN IF A>5 THEN LOCATE A,61:PRINT" ":A=A-1:O=O-1:LOCATE
A,61:PRINT"-":GOTO 2180
2125 IF A$=CHR$(0)+"P" THEN IF A<14 AND O<(F-1)THEN LOCATE A,61:PRINT" ":A=A+1:O
=O+1:LOCATE A,61:PRINT"-":GOTO 2180
2130 IF A$<>CHR$(0)+"P" OR (A$=CHR$(0)+"P" AND O=>F-1) THEN GOTO 2145
2135 FOR T=2 TO 10:X(T-1)=X(T):NEXT:O=O+1:P=P+1:GET(488,40)-(631,111),SCR
2140 VIEW(480,31)-(632,111):CLS:VIEW:PUT(488,32),SCR:X(O-P)=ASC(S$(O)):LOCATE A,
61:PRINT"-";LEFT$(S$(O),18)
2145 IF A$<>CHR$(0)+"H" OR (A$=CHR$(0)+"H" AND O=<1) THEN GOTO 2160
2150 FOR T=9 TO 1 STEP-1:X(T+1)=X(T):NEXT:O=O-1:P=P-1:GET(488,32)-(631,103),SCR
2155 VIEW(480,31)-(632,111):CLS:VIEW:PUT(488,40),SCR:X(O-P)=ASC(S$(O)):LOCATE A,
61:PRINT"-";LEFT$(S$(O),18)
2160 IF A$=CHR$(13) OR A$=" " THEN GOTO 2500
2180 IF X(O-P)=32 THEN GET(394,A*8-9)-(464,A*8+1),OCU:PUT(394,A*8-9),CUR,PSET:X(
19)=1
2190 LOCATE 3,61:PRINT"-";O;"  ":GOTO 2115
2500 IF X(16)=-1 THEN VIEW(0,0)-(473,189):CLS:VIEW:PUT(0,0),NEV
2505 GET #1,O+1:N$=NN$:M$=MM$:F=CVI(F$):LOCATE 1,5:PRINT N$
2510 X(16)=O:X(18)=5:FOR T=1 TO 64 STEP 4:X(17)=4:FOR O=0 TO 3
2515 LOCATE X(18),X(17):PRINT MID$(MM$,T+O,1):X(17)=X(17)+7:NEXT:X(18)=X(18)+1:I
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F X(18)=9 OR X(18)=14 OR X(18)=19 THEN X(18)=X(18)+1
2520 NEXT
2525 X(18)=5:FOR T=65 TO 128 STEP 4:X(17)=35:FOR O=0 TO 3
2530 LOCATE X(18),X(17):PRINT MID$(MM$,T+O,1):X(17)=X(17)+7:NEXT:X(18)=X(18)+1:I
F X(18)=9 OR X(18)=14 OR X(18)=19 THEN X(18)=X(18)+1
2535 NEXT:O=X(16):X(16)=-1
2550 IF ASC(N$)=32 THEN N$=CHR$(0)+RIGHT$(N$,54)
2555 X(O-P)=ASC(N$):S$(O)=N$:LSET NN$=N$:LSET MM$=M$:LSET F$=MKI$(F):PUT #1,O+1:
GET #1,1:F=CVI(F$):GOTO 2115
2600 GET #1,O:N$=NN$:M$=MM$:F=CVI(F$):LOCATE 1,1:PRINT"┤:
                    :       ":LOCATE 1,5:PRINT N$
2610 X(20)=O:X(22)=5:FOR T=1 TO 64 STEP 4:X(21)=4:FOR O=0 TO 3
2620 LOCATE X(22),X(21):PRINT MID$(MM$,T+O,1):X(21)=X(21)+7:NEXT:X(22)=X(22)+1:I
F X(22)=9 OR X(22)=14 OR X(22)=19 THEN X(22)=X(22)+1
2630 NEXT:O=X(20)
2650 N$=CHR$(0)+RIGHT$(N$,53):X(O)=CINT(45-(32-ASC(N$))*.1):LSET NN$=N$:LSET MM$
=M$:LSET F$=MKI$(F):PUT #1,O:GET #1,1:F=CVI(F$):GOTO 2110
3000 FOR T=48 TO 57:GET #1,T:S$(T)=DD$:X(T)=CVI(DX$):Y(T)=CVI(DY$):NEXT:END
3010 SCREEN 1:PRINT"enter-"
3020 A$=INKEY$:IF A$="" THEN 3020 ELSE PRINT A$:PRINT"draw ";A$
3030 B$=INKEY$:IF B$="" THEN 3030 ELSE IF B$<>"" THEN 3010
3040 CLS:A=ASC(A$):DRAW"bm160,70"+S$(A):PAINT(160+X(A),70+Y(A)),3,3:GOTO 3010
5000 S$(146)="bdbr12f3df2df2df2df2df2d120bu3r14uhuh2uh2uh2g2dg2dg2dgdbd316ue2ue2
ue2ue2ue2ue3":X(146)=12:Y(146)=4:S(1)=146
5005 S$(148)="bd10br22g1g1g1g1g1g1g1g1g1u10br3d6ererererereh1h1h1h1h12d5b13u10
rfrfrfrfrfrfrfrfrfrf":X(148)=19:Y(148)=10:S(2)=148
5010 S$(151)="bd10br2ererererererererererd10b13d51h1h1h1h1hererererererd5br3d10l1h1
h1h1h1h1h1h1h1h1h":X(151)=6:Y(151)=10:S(3)=151
5015 S$(153)="bdbr12f3df2df2df2df2df2d14uhuh2uh2uh2uh2g2dg2dg2dg2dgdl4ue2ue2ue2u
e2ue2ue3":X(153)=12:Y(153)=4:S(4)=153
5020 S$(155)="br2r1d3rfrfrfrfrfrfrfrfg1g1g1g1g1g1g2d2rererererererererererererh1h1h1h1h
1h1h1h1h1":X(155)=19:Y(155)=10:S(5)=155
5025 S$(157)="bd10br2ererererererererererererd3g1g1g1g1g1g1g1gfrfrfrfrfrfrfrfd31h1h1h1h1h1
h1h1h1h1h1h":X(157)=6:Y(157)=10:S(6)=157
5030 S$(161)="bd2br10r4fr2frf2frf2dfdfd10l4u10huh21h14g1g2dgd10l4u10eueue2rer2e":X(1
61)=12:Y(161)=3:S(7)=161
5035 S$(163)="bdbr2r12fr2frf3dfd5gdg31g12g112u3r12ere2ueu3huh21h112u3":X(163)=20
:Y(163)=10:S(8)=163
5040 S$(165)="bdbr10r12d3112g1g2dgd3fdf2rfr12d3112h12h1h3uhu5eue3rer2e":X(165)=2
:Y(165)=10:S(9)=165
5045 S$(168)="br10rbd2r3f2d3g213h2u3e2bu2r4frfdfd3gdg1g15d914u16euere":X(168)=8:
Y(168)=7
5050 S$(170)="br14r4d16gdg1g1bu213h2u3e2r3f2d3g2bd214h1huhu3euerer5u9":X(170)=16
:Y(170)=13:S(11)=170
5055 S$(172)="br6r4d9rbd2r3f2d3g213h2u3e2bu2r4frfdfd3gdg1g15h1huhu16":X(172)=8:Y
(172)=13
5060 S$(184)="br3r19d3115d1714u20":X(184)=5:Y(184)=2
5065 S$(186)="bdbr17r4d19119u3r15u16":X(186)=19:Y(186)=3
5070 S$(188)="bdbr3r4d16r15d3119u19":X(188)=5:Y(188)=3
5075 S$(191)="bd8br5rbd3r2f2d2g212h2u2e2bu3r18d3111dfd2gdg21g14h1h2uhu2eue2re":X
(191)=5:Y(191)=9
5080 S$(193)="bd8br14rbd3r3f2d2g213h2u2e2bu3r4frf2dfd2gdg21g119u3r10uhu2eue2re":
X(193)=15:Y(193)=9
5085 S$(195)="bd8br5rbd3r2f2d2g213h2u2e2rbu3r2frf2dfd2gdr12d3119h1h2uhu2eue2re":
X(195)=6:Y(195)=9
5090 S$(198)="br16r4d5gdg21g1g15d914u12r8ere2u5":X(198)=17:Y(198)=1
5095 S$(200)="br16r4d1218g1g2d514u5eue2rerer5u9":X(200)=17:Y(200)=1
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5100 S$(202)="br4r4d9r5frfrf2dfd514u5h21h18u12":X(202)=5:Y(202)=1
5105 S$(205)="bd8br5r19d3118g2d2f2r4d315h1h2uhu2eue2re":X(205)=5:Y(205)=9
5110 S$(207)="bd8br14r5frf2dfd2gdg21g119u3r19ueu2h214u3":X(207)=15:Y(207)=9
5115 S$(209)="bd8br5r5d314g2d2f2r18d3119h1h2uhu2eue2re":X(209)=5:Y(209)=9
5120 S$(212)="br5r4f11d112d814u11r9h9r":X(212)=6:Y(212)=1
5125 S$(214)="br16r4d1119f915h11ur12u8":X(214)=18:Y(214)=2
5130 S$(216)="br4r4d8r12dg1115e919u11":X(216)=5:Y(216)=1
5135 S$(226)="bd9br5r6frf2dfd3r8d3112u6h214g2d614u6eue2re":X(226)=11:Y(226)=11
5140 S$(228)="br5r9frf2dfd3gdg21g15d714u10r8e2u3h218u3":X(228)=15:Y(228)=10
5145 S$(230)="br1919g1g2dgd3fdf2rfr5d7r4u1018h2u3e2r8u3":X(230)=8:Y(230)=10
5150 S$(233)="br14r5frf2dfd2gdg21g14bu3r3e2u2h213g2d2f2bd312d814u10b14u313h2u3e2
r5d15d5r5d41u413u12u3r2ubr101g2dgd4":X(233)=11:Y(233)=7
5155 S$(235)="br19r4d15gdg21g1bu313h2u2e2r3f2d2g2bd314h1h2uhu2eue2rer6u8 b114bd1
0u313h2u3e2r5d15d5r5d4lu413ul2u3r2":X(235)=21:Y(235)=12
5160 S$(237)="br9r4d8r2bd3r3f2d2g213h2u2e2bu3r4frf2dfd2gdg21g15h1h2uhu15 b15bd10
u313h2u3e2r5d15d5r5d4lu413ul2u3r2":X(237)=11:Y(237)=13
5165 S$(177)="br9r6frfdfd314u2h212g2d1514u16euere":X(177)=7:Y(177)=3
5170 S$(179)="br15r4d16gdg1g16h1huhu3r4d2f2r2e2u15":X(179)=16:Y(179)=17
5175 S$(181)="br5r4d15f2r2e2u2r4d3gdg1g16h1huhu16":X(181)=8:Y(181)=17
5180 S$(219)="br13r1g12dgd2fdfrfrbu2r2e2u2h212g2d2f2bd2r3ereueu2huh1he4rfdfdfdfd
fdfdf2r3uhuhuhuhuhuhuhuhuhu":X(219)=6:Y(219)=10
5185 S$(221)="br5rbd2r2f2d2g212h2u2e2bu2r5frf10dg1g12g12g12g12g12g12d12u3rer2er2
er2er2ererh5gdg1g14h1huhu2euere":X(221)=16:Y(221)=6
5190 S$(223)="br12r3bd2r2f2d2g212h2u2e2bu2r3frfdfd2gdg1g14h1huhg5rfrfr2fr2fr2fr2
frd312u12h12h12h12h12h12h1hue10re":X(223)=7:Y(223)=6
5195 S$(240)="br14r6frfdfd314u2h212g2d1514u16euereb1131gdfr2u2d2r2d4freuh1fd212h
u414huerfd":X(240)=12:Y(240)=3
5200 S$(242)="br15r4d16gdg1g16h1huhu3r4d2f2r2e2u15b191gdfr2u2d2r2d4freuh1fd212hu
414huerfd":X(242)=16:Y(242)=17
5205 S$(244)="br10r4d15f2r2e2u2r4d3gdg1g16h1huhu16b191gdfr2u2d2r2d4freuh1fd212hu
414huerfd":X(244)=13:Y(244)=17
5210 S$(48)="br9rbd3r3fd2fd6gd2g13hu2hu6eu2ebu3r4frfdfd2fd6gd2gdg1g15h1huhu2hu6e
u2euere":X(48)=6:Y(48)=9
5215 S$(49)="br10r4d17r3d3110u3r3u1313ue3":X(49)=12:Y(49)=9
5220 S$(50)="br9r5frfdfd3gdg31g3d2r8d3112u5eue3re3u3h13gd214u2euere":X(50)=14:Y(
50)=9
5225 S$(51)="br9r5frfdfd3gdgfdfd3gdg1g15h1hu3r4d2r3eu4h14u3r4eu3h13d214u3ere":X(
51)=14:Y(51)=9
5230 S$(52)="br12r4dgdgdgdgdgd2r4u5r4d5r2d312d514u519u3eueueueueueu":X(52)=9:Y(5
2)=9
5235 S$(53)="br6r12d318d4r4frf2dfd3gdg21g14h1h2u3r4d2fr2e2u3h217u10":X(53)=13:Y(
53)=9
5240 S$(54)="br12r5fdg15g1gd4rer3frf2dfd2gdg21g14h1h2uhbr4u2e2r2f2d2g212h2b14u10
euerer2e":X(54)=7:Y(54)=11
5245 S$(55)="br5r13d6gdgdgdgd714u7eueueueu319u3":X(55)=15:Y(55)=8
5250 S$(56)="br9rbd3r3fd3g13hu3ebu3r4frfdfd3gdgfdfd3gdg1g14bu3r3eu4h13gd4fbd31h1
huhu3euehuhu3euere":X(56)=12:Y(56)=9
5255 S$(57)="br10r4frf2dfb14d2g212h2u2e2r2f2br4d9gdg21g12g14huer4ere2u31g13h1h2u
hu2eue2re":X(57)=17:Y(57)=9
5300 RETURN
6100 GET #1,1:F=CVI(F$):LOCATE 3,63:PRINT"  ":LINE(490,15)-(560,25),,B:GET
(490,15)-(561,25),CUR:PUT(490,15),CUR:LOCATE 3,61:PRINT"- 1 ":LOCATE 16,62
:PRINT F-1;" ":FOR T=2 TO F:GET #1,T:S$(T-1)=NN$:NEXT
7000 IF N=0 THEN GOTO 7100
7010 IF A$="" THEN A$="1":RETURN
7015 IF A$="┼" THEN A$="2":RETURN
7020 IF A$="" THEN A$="3":RETURN
```